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Use of polyvinyl alcohol sponge in alveoloplasty: a preliminary report

■ *J. Lewin-Epstein, D.D.S., Jerusalem, Israel*

Four cases are reported in which polyvinyl sponge implants were used to solve the problem of the knife-edged mandibular ridge. Microscopic study of implanted specimens revealed fibrosis and giant cell response but no evidence of inflammation. Fixation by alveolar process suture aided in retention. The question of eventual absorption of the implant remains open.

The surgical preparation of the oral cavity is an accepted and integral procedure prior to construction of dentures. However, the management of certain problems often has proved mutually unsatisfactory to prosthodontist and oral surgeon alike. The sharp and thin mandibular ridge, the so-called knife-edged ridge, with or without undercuts, is perhaps one of the major problems.

Landa[1] found that after routine alveoloplasty, newly formed sharp points could be observed under stress of dentures. He advocated overcoming this difficulty by relieving the denture overlying this sensitive area. This procedure can be accepted as a temporary measure, for as the denture settles, this part of the process will again be subject to stress.

Moore, Smith, and Field[2] have recommended the subperiosteal implantation of absorbable gelatin sponge (Gelfoam) for the elimination of undercuts. When I used this method, after several months the undercuts reappeared after resorption of the gelatin sponge.

Because of the futility of resorting to ordinary alveoloplasty and the failure with absorbable gelatin sponge, a substitute for the latter material was sought. The subperiosteal implantation of polyvinyl alcohol sponge (Ivalon) has been investigated, and the results are reported.

The physical and chemical properties of polyvinyl sponge have been well documented in the literature,[3-6] so that only highlights of its characteristics will be enumerated.

In pure form, polyvinyl sponge is white. When dry, it is hard and rigid, and can be cut with a knife or saw. It is soft

and resilient when moist, and can be cut with a knife or scissors. It is elastic, tough, and has great tensile strength. The sponge has great affinity for water and dries slowly. Temperatures up to 120°C. have no effect on the sponge, but at higher temperatures it turns brown. If the shape of the sponge is changed at above 95°C., and in that state allowed to cool, it will maintain its new shape. Its original shape can be restored by reheating above 95°C.

The sponge has no odor or taste. At ordinary temperatures it is inert to almost all chemicals. It is not affected by strong or weak alkalies, weak or moderately strong acids, and organic solvents. It is adversely affected by strong acids and by strong solutions of certain synthetic detergents.

Before the sponge is sterilized, it must be washed thoroughly in order to remove hygroscopic substances added by the manufacturer. Sterilization can be achieved by boiling or autoclaving. It should be placed in a vessel large enough to permit free floating in order to avoid deformation.

The plastic material has been shown to be well tolerated by animal and human tissues. Little or no inflammation can be demonstrated after a reasonable period following its implantation. The natural spaces of the sponge are rapidly invaded by newly formed connective tissue.

The rationale for its use, therefore, was that it would: (1) eliminate undercuts; (2) widen the alveolar process; (3) act as a shock absorber to protect the alveolar bone against denture stresses, because of its capacity to act as a scaffold for connective tissue, and (4) possibly stimulate osteogenesis.

To date, polyvinyl sponge implants have been inserted in seven selected patients. Four representative cases will be reported to illustrate the technic evolved, and show the complications encountered in the process.

■ *Report of Cases*

CASE 1—A 52 year old edentulous man had unsatisfactory complete upper and lower dentures. The maxillary alveolar process presented no problem. The mandibular process, on the other hand, exhibited evidence of considerable resorption in the posterior regions, commensurate with supporting a partial denture for many years. The region of the six anterior teeth was about 6 mm. higher than the posterior region. The overlying soft tissue was mobile, with a labiolingual dimension of about 3 mm. The occlusal roentgenogram revealed sparse and uneven projections of alveolar bone with large nutrient canals passing vertically. On July 17, 1957, with the patient under local anesthesia, a subperiosteal implantation of polyvinyl sponge was undertaken. The patient was prepared and draped in the accepted manner, and the region was isolated, dried, and disinfected with benzalkonium chloride 1:1,000. A horizontal incision was made on the lingual side about 6 mm. below the crest of the ridge. It was extended to both second bicuspid regions, and from this point, curved over the ridge down to the fornix of the vestibule (Fig. 1,A). The mucoperiosteal flap was reflected labially, exposing sharp, uneven and spongy alveolar bone, which was removed with rongeur forceps. A sterile polyvinyl sponge, cut to proper shape, was placed on the labial

surface of the bone, slightly overlapping the crest of the ridge. The flap was returned to place over the sponge and coaptated by means of interrupted silk sutures. The old lower denture was relieved on the inner surface, lined with a zinc oxide-eugenol paste, and inserted over the wound. Alternate sutures were removed on the fifth postoperative day; the remainder were removed on the twelfth day.

Postoperatively there was the usual edema. The only complication encountered was that the left end of the sponge had changed its position and had shifted toward the vestibule. Surgical intervention to correct this displacement was delayed until April 2, 1958 (eight and a half months later), in order to obtain instructive histologic material. The wound at the site of the biopsy failed to heal, exposing the edge of the sponge, but was asymptomatic. This was corrected on July 9 by pulling on the protruding sponge, cutting off a piece, tucking the remainder about 5 mm. away from the opening, and suturing the freshened edges of the wound. The sinus tract has not reappeared to date. In the meantime, new upper and lower dentures had been constructed and inserted on January 3, 1958. Follow-up models of the lower ridge were made at various intervals. A midline cross section of these models are shown in Figure 2.

Fig. 1—A, design of incision line for labially placed implant. B, design of incision line for lingually placed implant

CASE 2—A 66 year old man appeared on February 5, 1958. The edentulous maxillary process was satisfactory for complete denture construction. The posterior regions of the edentulous mandible had borne a partial denture for many years and revealed considerable resorption, especially on the right side. The cuspid-to-cuspid region was high, and had undercuts on its labial aspect (Fig. 3, above left). The cuspids had been removed two months previously. The roentgenogram is shown in Figure 3, above right.

A subperiosteal implantation of polyvinyl sponge was undertaken, in conjunction with alveoloplasty, on February 19. The surgical procedure was similar to that described in Case 1, with one modification. After the excessive height of the thin bony ridge was removed (no attempt was made to eliminate the undercuts), three holes were drilled through the alveolar bone, labiolingually. They were placed about 1 cm. below the crest, one at center,

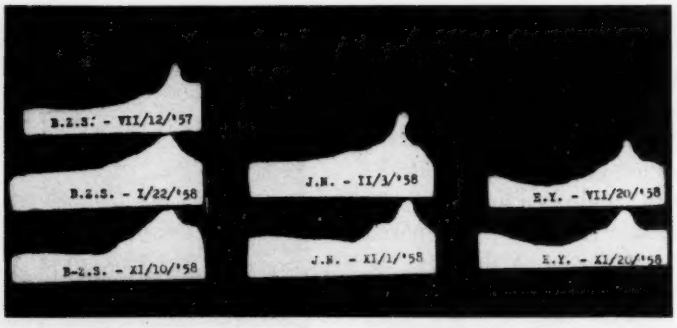

Fig. 2—Cases 1 (left), 2 (center) and 3 (right). Midline cross section of plaster models taken before and after sponge implantation

and the other two at the cuspid regions. Three silk ligatures were passed through these holes by means of a large, curved needle. Once the properly shaped sponge was positioned, the ligatures were tied over the sponge, thus fixing it to the bone (Fig. 3, below left). This was done in order to overcome the uncontrolled shifting of the loose sponge during the early postoperative days. Figure 3, below right, shows the anterior aspect of the alveolar ridge with the implanted sponge on the tenth postoperative day prior to the removal of the remaining sutures. Healing was uncomplicated. Complete upper and lower dentures were inserted on May 11, with satisfactory results during an observation period of more than one year.

CASE 3—A 58 year old man was referred from the prosthetics department for the surgical correction of the lower anterior alveolar ridge. A subperiosteal implantation of polyvinyl sponge was decided on. Because of the prognathic relation of the lower alveolar process, an implant was placed lingually on July 20, 1958. The operation was essentially similar to that performed in Case 2, except that the incision was made labially (Fig. 1,B), and chromic gut was substituted for the silk ligatures immobilizing the sponge. There were no complications, but the postoperative pain and swelling were more severe and prolonged. The patient was referred back to the prosthetics department six weeks later where complete upper and lower dentures were constructed.

CASE 4—A woman over 50 was referred from the prosthetic department for the surgical correction of the lower anterior segment of the alveolar process. Her remaining anterior teeth had been removed between March and July 1958. As in the previous case, a subperiosteal implant of polyvinyl sponge was inserted lingually, on September 10. The sponge did not cover the crest of the ridge. Because of a slight undercut in the right first incisor region, a small piece of sponge was also placed at this point on the labial side despite its proximity to the incision line.

The postoperative course was rather

stormy, accompanied by pain, swelling and ecchymosis for over two weeks. By the end of this time the sponge was exposed at two points along the incision line: one was the labially placed piece of sponge, and the other was at the extreme left, where the incision traversed the ridge (Fig. 4). On October 29, the anterior sponge was extracted *in toto* without suturing the wound, while on the left side, a piece of sponge was cut away about 6 mm. medial to the opening, and the freshened wound closed with two silk sutures. Healing progressed rapidly with no sinus tract present to date—seven months later. Complete upper and lower dentures were inserted three months postoperatively. When last examined, the patient complained of sore spots in the right cuspid region. Results in this case must be considered unsatisfactory.

■ *Microscopic Findings*

The implanted material was prepared for histological examination by the celloidin-paraffin embedding technic. Several stains were used. The plastic sponge takes the resorcin-fuchsin stain for elastic fibers (Fig. 5, above left).

Histological studies made of polyvinyl sponge after subperiosteal implantation in animals, as well as the biopsy material obtained from Case 1, confirm the findings of other investigators that this plastic material is well tolerated by the host tissues.

The sponge, as a whole, is circumscribed by a capsule of mature fibrous

Fig. 3—Case 2. Above left: Preoperative view. Note undercuts. Above right: Preoperative view. Below left: Sponge ligated to alveolar process. Below right: View ten days postoperatively

Fig. 4—Case 4. View showing exposed sponges

connective tissue (scar tissue). Likewise, the spaces within the sponge are totally filled with this same type of tissue. No inflammatory cell infiltration could be demonstrated (Fig. 5, above left). On the other hand, numerous foreign body giant cells were observed, usually close to the sponge. The distribution of the giant cells was uneven: although totally absent in some areas, they were profuse in others, to the extent of lining the entire circumference of a section of sponge (Fig. 5, above right).

These findings were noted on all implanted plastic sponges, except for the one removed in Case 4. No tissue was noted in the exfoliative part of the sponge, but where it had been excised from within the wound, acute inflammation was present (Fig. 5, below).

■ *Discussion*

Clinical experience with polyvinyl alcohol sponge has ranged over some ten years. The sponge has been implanted for diverse purposes: filling the extensive gaps incurred after pulmonary lobectomies,[3] as reinforcement in hernia repair,[6] augmented mammaplasty,[7] connective tissue studies,[8] and others. Although there have been reports of malignancy in animals[9-11] as a result of experimental implantation of plastic materials (including polyvinyl sponge), no instance of malignancy in human beings has been reported to date.

In the present study, only cases not amenable to routine alveoloplasty were chosen. Several labial undercuts were present in two instances. Of the seven subperiosteal implants, two were placed on the lingual aspect, whereas the rest were placed on the labial aspect of the alveolar process.

In the first postoperative weeks the consistency of the implanted region was very resilient. With time there was a transformation to a harder consistency, which eventually resembled the firm fibrous ridge often noted in the tuberosity regions. This transformation conformed to the observed and reported histologic picture, whereby first, blood infused into the sponge spaces, clotted, then underwent organization. In the first weeks there was an abundance of cellular connective tissue, which, in time, was replaced by bundles of collagen fibers, as found in scar tissue.

The patients were referred to the prosthetics department only after some firmness had been noted—six to eight weeks postoperatively. Since, however, no change has been found in the shape of the tissue once the edema subsided, it is doubtful whether such a delay is really necessary. Impressions could be taken as soon as the wound has healed and the edema has disappeared—about two to three weeks postoperatively. As could be anticipated, the postoperative sequelae after lingual placement of implants were more severe and prolonged.

Careful attention must be paid to

ensure that the incision line does not encroach on the intended site of placement of the sponge, and conversely, once the incision is made, that the sponge be placed at a distance from the suture line. A distance of at least 5 mm. is necessary. According to Neuman's[12] observations with polyethylene sponge implanted subcutaneously in rats, a safe distance is 10 mm. For the same reason, care must be taken not to perforate the mucoperiosteal flap meant to cover the sponge. Should such damage occur, it would be advisable to forego the implantation at that time. Immobilizing the sponge by ligating it to the alveolar process precludes a shift in its position, especially during coaptation of the soft tissues, and prevents its later encroachment on the incision line.

As can be seen in Figure 2, the contours of the alveolar processes have been greatly improved by the implants. The firm and widened ridges appear to withstand denture stresses rather well. In Case 1 a biopsy specimen was taken three months after insertion of the patient's new dentures. No breakdown of the gingival tissues has been noted as a result of these stresses. Where the sponge did not cover the crest of the ridge, as in Case 4, sharp and tender bony points could be palpated, whereas in the others this was not so, even over a longer observation period. The breakdown of gingival tissues should be

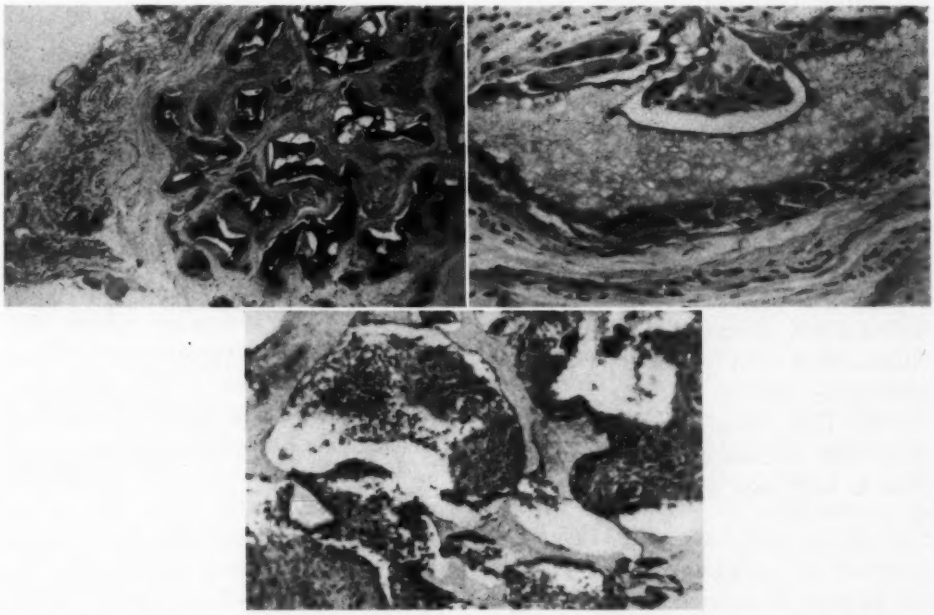

Fig. 5—Above left: Biopsy specimen in Case 1. Sponge (darkly stained) is totally surrounded by collagen fibers. Note absence of inflammatory reaction. (Resorcin-fuchsin stain.) Above right: Biopsy specimen in Case 1, showing sponge circumscribed by foreign body giant cells. (Hematoxylin and eosin stain.) Below: Exfoliated sponge in Case 4, showing acute inflammatory reaction. (Hematoxylin and eosin stain)

anticipated over these sharp points. Therefore, every attempt should be made to have the sponge cover the crest of the ridge.

The assumption that the sponge is nonabsorbable is premature in the light of the constant finding of foreign body giant cells. Clinical observations, however, have not shown any radical changes. Thus, even if absorption does take place, it does so slowly.

Experiments with polyvinyl sponge implants are continuing in other parts of the oral cavity as well, in an attempt to solve other reconstructive problems.

■ *Summary and Conclusions*

Polyvinyl alcohol sponge was implanted subperiosteally in the anterior mandibular region of seven patients over the age of 50. Observations have ranged over a period of 8 to 21 months. In spite of the limited number of clinical cases, the following conclusions seem to be warranted:

1. Polyvinyl sponge does not evoke an inflammatory reaction; this confirms earlier findings.

2. The sponge evokes a foreign body reaction, as evidenced by the fibrous encapsulation and presence of foreign body giant cells.

3. The constant presence of the giant cells necessitates further investigations to determine whether the assumption that the sponge is nonabsorbable is correct.

4. Proximity of the sponge to the incision line predisposes to its exposure and exfoliation.

5. Ligation of the sponge to the alveolar process immobilizes it during the early period of organization.

6. Sharp bony points persist under denture stresses unless the crest is covered by the sponge. When the crest is covered properly, patients experience no discomfort in this region.

From the department of oral surgery, Hebrew University-Hadassah School of Dentistry.

1. Landa, J. S. Troublesome transition from a partial lower to a complete lower denture. J. Pros. Den. 4:42 Jan. 1954.

2. Moore, R. H.; Smith, Q. M., and Field, J. L. Stimulation of new tissue growth as an adjunct to alveoplasty. Oral Surg., Oral Med. & Oral Path. 6:812 July 1953.

3. Grindlay, J. H., and Clagett, O. T. Plastic sponge prosthesis for use after pneumonectomy: preliminary report of an experimental study. Proc. Staff Meet., Mayo Clin. 24:538 Oct. 12, 1949.

4. Grindlay, J. H., and Waugh, J. M. Plastic sponge which acts as a framework for living tissue. A.M.A. Arch. Surg. 63:288 Sept. 1951.

5. Moore, A. M., and Brown, J. B. Investigation of polyvinyl compounds for use as subcutaneous prosthesis. Plast. & Reconstr. Surg. 10:453 Dec. 1952.

6. Schofield, T. L. Polyvinyl alcohol sponge; an inert plastic for use as a prosthesis in the repair of large hernias. Brit. J. Surg. 42:618 May 1955.

7. Edgerton, M. T., and McClary, A. R. Augmentation mammaplasty: psychiatric implications and surgical indications with special reference to use of the polyvinyl alcohol sponge (Ivalon). Plast. & Reconstr. Surg. 21:279 April 1958.

8. Boucek, R. J., and Noble, N. L. Connective tissue; technique for its isolation and study. A.M.A. Arch. Path. 59:553 May 1955.

9. Oppenheimer, B. S., and others. Malignant tumors resulting from embedding plastics in rodents. Science 118:305 Sept. 11, 1953.

10. Oppenheimer, B. S.; Oppenheimer, E. T., and Stout, A. P. Carcinogenic effect of imbedding various plastic films in rats and mice. S. Forum 4:672, 1953.

11. Oppenheimer, B. S., and others. Further studies of polymers as carcinogenic agents in animals. Cancer Res. 15:333 June 1955.

12. Neuman, Z. Use of the non-absorbable polyethylene sponge, "Polystan Sponge," as a subcutaneous prosthesis; experimental study in rats. Brit. J. Plast. Surg. 9:195 Oct. 1956.

■ ORDERLINESS

We do not keep outward form of order, where there is deep disorder in the mind.—*Shakespeare.*

Effects of suturing extraction wounds in macacus rhesus monkeys

■ *Harold E. Simpson,* M.D.S., Newcastle upon Tyne, England*

Histologic examination of 20 extraction wounds over a period of eight weeks failed to demonstrate that approximation of the gingival margins by suture resulted in acceleration of the healing process. The position of the margins relative to the organizing clot appears to be the decisive factor in promoting early epithelization.

The suturing of a socket immediately after the extraction of a tooth suggests itself as the simplest method by which the healing processes might be accelerated, especially in the epithelium and subepithelial connective tissue. The advantages of suturing would lie in the approximation of the gingival margins whereby infection might be largely excluded, the retention of the clot promoted and the area requiring epithelization reduced.

In order to explore this possibility, teeth of macacus rhesus monkeys were extracted with forceps, and a single suture was inserted through each socket in a labiolingual direction. The suture was removed after seven days. Three suture materials were tried: catgut, silkworm gut and silk. Silk was found to be the most suitable. Catgut was difficult to handle and tended to tear out. Silkworm gut was rather stiff to manipulate in the small space available, and it also tended to tear the thin mucosa. Twenty sockets were examined and compared with the 20 unsutured sockets described in a previous article.[1]

At three days the gingival margins were well approximated, but epithelial proliferation was irregular and poorly situated for the purpose of sealing the wound (Fig. 1). The number of inflammatory cells in the superficial part of the blood clot was smaller than in the corresponding unsutured wound. Otherwise, suturing had produced no apparent change.

At one week the gingival margins were no longer held in apposition. Epithelial proliferation had not yet succeeded in covering the surface of the organizing clot, although in one instance it had almost done so. Osteoclasia of the alveolar crests was somewhat more noticeable than in the unsutured wounds; this is possibly attributable to the tension of the suture, but the greatest osteoclastic activity occurred on the interradicular septum of a maxillary premolar where this factor is unlikely to be operative.

At two weeks the epithelium was generally well united and several cells thick. It showed irregularity of its lower layers. The new bone at the sides of the socket extended to the level of the crests but, as in unsutured wounds, there was a cone of fibrous tissue occupying the

Fig. 1—Three day old forceps extraction wound closed by a single suture. Labial gingival margin has been brought across socket into apposition with lingual gingival margin. Epithelium is proliferating on undersurface of flap so produced

central part of the cervical region of the socket. Osteoclasia appeared to be confined at this stage to the removal of damaged bone or that bone which at three days was observed to have empty lacunae and which at two weeks was almost entirely eliminated. After two weeks there was no variation in the healing processes which could be ascribed to suturing.

■ *Discussion*

The main apparent disadvantage of the extraction of a tooth by means of forceps is that the blood clot is exposed to the mouth so that the clot may become infected or even fall out. The socket mouth being open, a considerably greater blood supply is necessary to keep it filled until clotting takes place, than where there is no free passage to the mouth. In sockets where the postextraction bleeding is slight, this circumstance predisposes to foreign body ingress and also to infection.

In many anterior sockets, a simple suture placed labiolingually will approximate closely the gingival margins. In posterior sockets the margins are not so readily brought together and often there is a substantial gap bridged by the suture. Even so, postextraction hemorrhage can often be arrested by suturing. Possibly the tension produced by the suture itself impedes the blood flow or the suture acts as a center for coagulation. Spitzer[2] (1924) remarked on the value of suturing in obtaining hemostasis. If the blood flow tends to be inadequate, any method which will reduce loss of blood from the socket will be helpful in producing an adequate clot.

The approximation of the gingival margins resulting from suturing is an advantage more apparent than real. The margins of an unsutured wound are sometimes better approximated than those of a sutured one, and the rate of epithelization is only partly dependent on the relation of those margins, the position of the margins relative to the organizing clot in the socket being more important. It is possible that by preventing the falling in of the gingival tissues, suturing may even delay the epithelization of the socket contents through increasing the distance over which the epithelium must proliferate. It is noteworthy that of the forceps extraction wounds examined, only one, a sutured wound, had an incomplete epithelial covering at two weeks. Possibly suturing had prevented the free escape of the products of inflammation.

The earlier investigators (Euler[3] in

1923, Balogh[4] in 1932) considered that the organization of the clot was facilitated by undamaged gingival tissues. The present experiments do not indicate that the gingival tissue has any such special function. No doubt, as Meyer[5] (1924) discovered, if the gingival tissues are removed so as to expose the bony margins of the socket, there will be a delay in healing. Even then, Meyer only recorded a delay of four or five days. If the gingival tissues are in their optimum in-curved position, the greater part of their connective tissue is separated from the clot by the crevice epithelium, and the small remaining surface between the epithelium and the alveolar bone is not particularly active in fibroplasia. An exception exists where the crevicular epithelium is extended toward the socket center; in this instance the larger area of the flap so produced is apparently of considerable assistance in the organization of the superficial part of the clot. This improvement in repair, however, cannot be claimed to be a result of suturing, but only of chance. If the gingival margins are not in contact with the clot, they cannot assist in its organization. Meyer[5] (1924) also claimed an advantage of five days in the healing of simple extraction wounds after 19 days as a result of suturing. Guralnick[6] (1943) noted improved healing after suturing, especially of posterior teeth which are much less amenable to gingival approximation than anterior ones.

A certain amount of disturbance of the epithelium and subepithelial connective tissue is produced by the suture (Fig. 2), but this is a transitory effect and not an important feature in the sockets examined after two weeks.

Fig. 2—Two week old sutured forceps extraction wound. Inflammatory reaction near buccal crest is caused by small sequestrum. It appears to have slightly delayed bone formation on that side

■ *Conclusions*

No real advantage can be claimed for the suturing of sockets as a routine measure. In the present experiments it was not possible to distinguish sutured from unsutured wounds except that there were fewer inflammatory cells at three days and in general a small disturbance of the epithelium resulting from the effect of the suture.

Suturing may reduce infection and it often arrests hemorrhage but, as gross infection and excessive bleeding were not encountered in these experiments, the value of suturing in these respects could not be assessed.

■ *Summary*

Twenty teeth were extracted from macacus rhesus monkeys, and the sockets

were sutured. A histological examination was made of the experimental material at intervals extending from three days to eight weeks from the time of extraction, and a comparison was made with equivalent unsutured sockets.

Healing proceeded in a manner little different from that observed in unsutured wounds. No real advantage can be claimed for the simple suturing of extraction wounds, and any slight reduction of the inflammatory infiltration in the first few days is likely to be outweighed by the inconvenience attached to the procedure itself.

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1. Simpson, H. E. Experimental investigation into the healing of extraction wounds in macacus rhesus monkeys. J. Oral Surg., Anesth. & Hosp. D. Serv. 18:391 Sept. 1960.

2. Spitzer, B. Die Heilung der Extraktionswunde. Wien. med. Wschr. 74:2515 Nov. 1924.

3. Euler, H. Die Heilung von Extraktionswunden (eine tierexperimentelle Studie). Deut. Mschr. Zahnhk. 41:685 Dec. 15, 1923.

4. Balogh, K. Histologische Untersuchungen über die Heilung von Extraktionswunden nach der chirurgischen Entfernung der fazialen Alveolarwand. Zschr. stomat. 30:281 March 1932.

5. Meyer, W. Die Heilung von Extraktionswunden unter abnormen Verhältnissen. Zschr. stomat. 22:521 Aug. 1924.

6. Guralnick, W. C. Experiences in exodontia and oral surgery at an Army post. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 29:241 May 1943.

Role of anaerobic streptococci in oral surgery

■ *Edward J. Degnan,* D.D.S., Albany, N. Y.; Edward C. Hinds,† D.D.S., M.D., and Ashley H. Sills, Jr.,‡ D.D.S., Houston, Texas*

Postsurgical infection has been reduced dramatically since the advent of antibiotics. However, antibiotic-resistant organisms may cause serious infections even in the face of what is ordinarily considered adequate antibiotic coverage. A special problem to the oral surgeon is the possibility of anaerobic streptococci acting synergistically or in combination with hemolytic Staphlococcus aureus or Actinomyces bovis. Tissue destruction must be present if anaerobic growth is to take place so that it is desirable to obtain a prompt therapeutic antibiotic level in the deeply infected tissues. Penicillin and streptomycin followed by a relatively long course of erythromycin and sulfisoxazole was found to be the treatment of choice in two instances of anaerobic streptococcal infections of the oral tissues.

The problem of serious surgical infection in oral surgery is not common. That such a fortunate situation exists can be partially attributed to the bacteriostatic action of the oral fluids. In major facial trauma uneventful early healing is the rule, because of the greater number of primary early wound closures brought about by antibiotic therapy. However, this paper will show that though we live in the antibiotic age, surgical infection is still a real problem, one that can develop even from a single tooth extraction.

Anaerobic streptococci make up a special category of gram-positive, nonhemolytic, chain-forming cocci which require for their growth either strict an-

aerobic conditions or only minute amounts of free oxygen.[1] Morphologically there is no difference between the aerobic and the anaerobic strain. The anaerobic streptococci are catalase-negative, usually nonmotile, and unlike the aerobic strain do not form capsules. These microorganisms have been recovered from apparently normal human mouths, intestines and vaginal canal. They produce in laboratory media a gas of putrid odor, the result of sulfur dioxide formation. Although the usual anaerobic streptococci are nonhemolytic on blood agar producing a green color, there are apparently many variants which are hemolytic. However, not all anaerobic streptococci produce this putrid odor. Therefore, any streptococci found microscopically but not recovered bacteriologically with aerobic technics should be recultured with anaerobic technics.

The following pages indicate the wide range of antibiotic therapy that has been used unsuccessfully against this type of organism. The authors will outline a specific course of therapy which in both reported cases met with complete resolution of clinical symptoms.

■ *Case 1*

On June 10, 1957, a 37 year old white man was admitted to the Veterans Administration Hospital, Houston, Texas, with a history of pain, swollen jaw and a partial trismus of three weeks' duration. He stated that he had received "some penicillin shots" from his doctor with no change in the clinical picture. Clinical examination revealed a patient in moderate distress, with considerable swelling at the right angle of the jaw, inability to open his mouth more than 15 mm. and an oral temperature of 101°. There was severe purulent drainage in the right buccal sulcus and the white blood cell count was 19,900. Lateral jaw roentgenograms revealed considerable radiolucency in the right coronoid process of the mandible with sequestrum formation evident (Fig. 1, above left). Dental roentgenograms revealed some evidence of bone destruction of the alveolar process surrounding the lower right second and third molars. Exudate from the right buccal sulcus was sent for culture and sensitivity tests to the laboratory (which later reported the presence of gram-positive micrococci in pairs and chains sensitive to all commonly used antibiotics).

A presumptive diagnosis of osteomyelitis of the mandible was made, and the patient was started on a course of novobiocin therapy (500 mg. immediately and 250 mg. four times a day). On June 14, the patient's condition was unchanged, and while he was under local anesthesia, an extraoral incision was made in the region of the swelling at the right angle of the jaw. No exudate was encountered. The novobiocin therapy was discontinued on this date and the administration of penicillin (600,000 units twice a day) and streptomycin (500 mg. twice a day) was initiated. The swelling continued unchanged. The trismus was now more severe and the patient still had a temperature of 101°.

On June 20, because of lack of response to the previously mentioned therapy, the use of penicillin and streptomycin was discontinued and chloramphenicol therapy (500 mg. immediately and 250 mg. four times a day) was in-

stituted in its place. On June 21 for the first time since the patient's admission to the hospital the temperature dropped to normal and white blood cell count was down to 10,700. However, by June 26 facial swelling was again pronounced, and a white blood cell count had risen to 16,700. On the same date, with the patient under general anesthesia, the mandible was explored extraorally to the level of the coronoid notch, and a Penrose drain was sutured in place. Tetracycline (1 Gm. daily) was added to the antibiotic therapy. Progressive roentgenograms revealed a further increase in the size of the bone lesion, and it was considered that since there was no clinical improvement, a more extensive incision and drainage should be undertaken. On July 2, with the patient under general anesthesia, a through and through type of drainage was carried out from the zygomatic arch to the angle of the mandible, using a small Foley catheter as a drain. A second catheter was placed on the medial aspect of the mandible to the level of the lingula. Irrigation through these catheters was carried out four times a day with a solution made up of the following proportions: (1) polymyxin, 1 mg. per cubic centimeter; (2) bacitracin, 200 units per cubic centimeter; and (3) neomycin, 2.5 mg. per cubic centimeter. A total of 100 cubic centimeters was used daily.

On July 24, there was a slight suppurative exudate intraorally. Anaerobic culture studies of a specimen of this material revealed the presence of anaerobic nonhemolytic streptococci. On the advice of Dr. E. Yow of the infectious disease section of Baylor University Medical School, the following course of therapy was initiated: The patient was started on aqueous penicillin (500,000 units every four hours) and streptomycin (2 Gm. daily). After the sequestrum was exfoliated and any involved teeth were extracted, relatively long term (six to ten weeks) erythromycin (1 Gm. daily) and sulfisoxazole (4 Gm. daily) therapy was to be started. On August 4, a sequestrum was removed through the lingual cortical plate of the ascending ramus. Further roentgenograms revealed no sequestrum present in the coronoid process (Fig. 1, above right). By August 6, the temperature was normal and the white blood cell count was within normal limits (9,200). Three days later the severity of trismus was reduced considerably, and the offending second and third molars were extracted. Streptomycin and penicillin therapy was discontinued. On the same day the aforementioned course of erythromycin and sulfisoxazole was started. Roentgenograms of the jaw revealed partial filling of the coronoid lesion (Fig. 1, below). At the conclusion of the long-term therapy, the patient was completely asymptomatic and was discharged from the hospital.

■ *Case 2*

A 40 year old white man was first seen February 4, 1956, with the chief complaint of pain and swelling of the right side of the lower jaw. The patient stated that he had a lower right second molar extracted in the middle of January with development of a "dry socket." The infection had not responded to conservative care.

Clinical examination revealed beginning granulation tissue in the apical por-

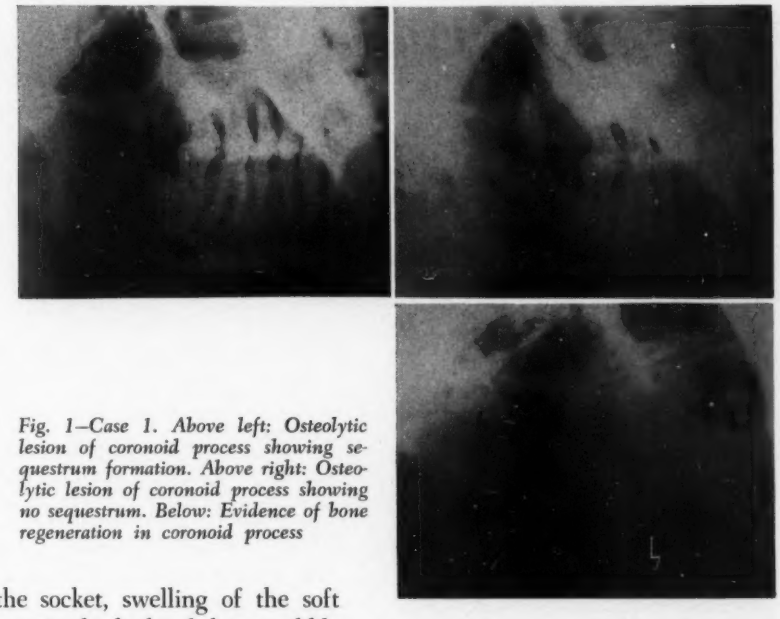

Fig. 1—Case 1. Above left: Osteolytic lesion of coronoid process showing sequestrum formation. Above right: Osteolytic lesion of coronoid process showing no sequestrum. Below: Evidence of bone regeneration in coronoid process

tion of the socket, swelling of the soft tissues opposite the body of the mandible and temperature elevation to 100°. Dental roentgenograms showed no abnormalities, and a diagnosis was made of alveolitis and early cellulitis. Treatment consisted of general supportive care plus oxytetracycline (1 Gm. daily). The patient began to improve, and by February 15, with the exception of minimal swelling, the patient was asymptomatic.

On March 6, the patient suddenly developed severe swelling of the right side of the face, acute pain in the right side of the lower jaw and an elevation of the white blood cell count to 15,000. The patient was hospitalized immediately and penicillin and streptomycin therapy was begun. Incision and drainage of the posterior buccal sulcus on the right side was carried out and some purulent exudate was obtained. The exudate was sent to the laboratory for culture and sensitivity tests. The patient improved rapidly and was discharged from the hospital on March 11. The results of the cultures and sensitivity test revealed gram-positive cocci in pairs, chains and small clusters which were extremely sensitive to chloramphenicol. Inasmuch as the patient responded favorably to the penicillin and streptomycin, it was decided not to change to chloramphenicol. At the time of the patient's discharge from the hospital, the white blood cell count was 8,700.

On March 25, considerable swelling in the region of the right angle with definite fluctuation in the right buccal sulcus was again noted. Incision and drainage were carried out with the liberation of a large amount of sanguine purulent material. A rubber drain was inserted. On March 28, because of the lack of clinical improvement, an extraoral incision and

Fig. 2—Case 2. Foley catheter sutured in place for irrigation

drainage of the right submaxillary region was carried out with the patient under general anesthesia. A putrid, foul-smelling exudate was recovered and sent to the microbiology section for anaerobic culture studies. However, on April 3, the patient suddenly developed increased swelling and was experiencing difficulty with swallowing. The area of induration was considerably enlarged and on April 4 extensive incision and drainage were carried out while the patient was under general anesthesia. Two incisions were made: one in the mental area, and one in the submaxillary area through which a rubber catheter was inserted and sutured to the skin (Fig. 2). Neomycin (2.5 mg. per cubic centimeter) was flushed several times daily through this catheter.

The patient's condition improved rapidly. The leukocyte count descended to 8,800, the temperature became normal and he was discharged from the hospital on April 9. However, two days later, drainage from both intraoral and extraoral sites was noted. At this time culture and sensitivity studies initiated on April 4 revealed the presence of both anaerobic streptococci and large colonies of *Actinomyces bovis*. Consultation was held with Dr. Yow. On April 11 the following course of therapy was started: aqueous penicillin (500,000 units four times daily), streptomycin (2 Gm. daily) and irrigation with bacitracin (500 units per cubic centimeter) several times daily. The patient improved rapidly and on April 20 the streptomycin and bacitracin irrigations were discontinued. The trismus which had been present during the entire course of the disease was now almost completely absent. The white blood cell count and temperature dropped to within normal limits, and on April 30 penicillin therapy was discontinued. In its place erythromycin (1 Gm. daily) and sulfisoxazole (4 Gm. daily) administration was started. By May 2 there was no further evidence of either intraoral or extraoral drainage, the submaxillary swelling was again minimal, and the patient was discharged from the dental service to continue on the antibiotic regimen at home.

■ *Discussion*

Anaerobic streptococci have serious pathogenic potentialities, especial in synergistic action with hemolytic *Staphylococcus aureus* or when superimposed on an already existing pathologic condition. As Meleney and co-authors[3] stated, this action is most evident in bacterial synergistic gangrene. To have any anaerobic growth, there must be areas of tissue destruction. Fahlberg[4] has found in a series of seven cases of actinomycosis that a definite anaerobic streptococcus was present. The patient in Case 1 had both types of organisms necessary for this bacterial

synergistic gangrene. The other case reported shows again the possibility of a relationship between *Actinomyces bovis* and anaerobic streptococcus.

One of the problems of therapy when dealing with anaerobic streptococci is to effect a prompt antibiotic level in the deeply infected tissues. For this reason and because it is bactericidal to streptococci, penicillin is the drug of choice. When penicillin is used in the presence of a staphylococcus, a serious problem of penicillinase production must be considered because any of the common contaminants of long-standing wounds (*Bacillus pyocyaneus, B. subtilis* and many gram-negative rods) are capable of producing penicillinase and nullifying the action of penicillin at the site of infection.

Yow[3] has found that penicillin and streptomycin followed by the relatively long-term courses of erythromycin and sulfisoxazole (or triple sulfa drugs) appear to be highly effective in combating anaerobic streptococci. However, this regimen must be tempered by the realization either that penicillinase may be produced or that a patient may be sensitive to penicillin. In such instances, a course of erythromycin (1 Gm. intravenously daily over an eight hour period supplemented with 2 Gm. by mouth) along with the routine streptomycin dosage has been found to be very effective. We are not certain whether irrigation of the wounds with antibiotics such as bacitracin, neomycin and polymyxin is of any real value in shortening the course of the disease. However, the irrigations will effectively reduce the chance of introducing further infection from surface contaminants.

■ *Conclusions*

1. Serious and resistant surgical infection continues to be a major problem despite the use of antibiotic therapy.

2. The possibility of an anaerobic streptococcal infection must be considered in the following instances: (1) any infection that does not respond to standard antibiotic therapy, and (2) any case of actinomycocis.

3. Intensive penicillin and streptomycin therapy followed by long-term erythromycin and sulfisoxazole therapy has been found in these two instances to be a most effective combination against anaerobic streptococci infection.

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1. Bacterial and mycotic infections of man, ed. 2. Dubos, R. J., editor. Philadelphia, J. B. Lippincott Co., 1952, p. 306-307.

2. Yow, E. Personal communication, 1958.

3. Meleney, F. L.; Shambaugh, P., and Millen, R. S. Systemic bacitracin in the treatment of progressive bacterial synergistic gangrene. Ann. Surg. 131:129 Feb. 1950.

4. Fahlberg, Willson. Personal communication, 1958.

■ Right of Speech

No mortal has a right to wag his tongue, much less to wag his pen, without saying something.—*Carlyer.*

Differential diagnosis and surgery of the submaxillary gland

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A large number of pathologic conditions which may result in swelling of the submaxillary gland are reviewed. The diagnostician should remember that such a swelling may result from infection, developmental disturbances, nondevelopmental cysts, and neoplasms, benign or malignant. A case report of submaxillary gland excision for sialolithiasis is presented with a review of the pertinent anatomy.

The submaxillary gland is the salivary gland most susceptible to obstructions of normal salivary flow. Calculi are found most often in Wharton's duct. Inspissated mucus or cellular debris can cause partial or complete obstruction of the submaxillary gland or its duct.

The symptoms of obstruction of the submaxillary gland and its duct are similar, regardless of the cause. The periodic painful swellings of the gland are classic. These swellings develop at times at the thought or sight of food, and they are generally more noticeable after eating. After a variable period, the symptoms may disappear gradually, partly because of compensatory changes such as pressure atrophy occurring within the gland. In chronic cases of obstruction, the primary cause is often calcified material in the body of the salivary gland.

Generally there is minimal clinical evidence of inflammation unless secondary infection of the gland has developed. When there is stasis of salivary flow, the submaxillary gland is predisposed to infection. If the condition is chronic, surgical removal of the gland usually is indicated. Sound surgical principles must be followed when this procedure is undertaken because of the proximity of many important anatomic structures.

The diagnosis of obstruction of the submaxillary gland and duct usually can be made on the basis of: (1) an adequate history, (2) bimanual palpation, (3) roentgenographic studies, (4) stimulation of salivary flow with acid or sour foods, and (5) an understanding of the possible differential diagnosis.

In determining the quality and the quantity of the saliva expressed from the

submaxillary gland, it is often helpful to paint the orifice of the duct and adjacent soft tissue of the floor of the mouth with tincture of benzoin. This not only stimulates increased salivary flow but produces a contrasting background for better visualization.

■ *Differential Diagnosis*

In making a differential diagnosis of swellings in the submaxillary gland region, the following conditions must be considered:

I. Infections:
   A. Sialadenitis – nonspecific (acute or chronic with or without sialolithiasis)
   B. Sialodochitis
   C. Tuberculosis
   D. Sarcoidosis
   E. Actinomycosis
   F. Epidemic parotitis
   G. Mikulicz's disease

II. Developmental disturbances:
   A. Aberrant gland or tissue
   B. Atresia of salivary duct
   C. Displacement and fusion of the glands
   D. Dermoid cyst
   E. Brachial cleft cyst
   F. Thyroglossal duct cyst
   G. Epidermoid cyst

III. Nondevelopmental cysts:
   A. Retention cyst: (1) sublingual cyst; (2) submental cyst; (3) submaxillary cyst
   B. Inclusion cyst

IV. Neoplasms:
   A. Benign growths: (1) mixed; (2) adenoma; (3) mucoepidermoid; (4) hemangioma; (5) neurofibroma; (6) neuroma; (7) lipoma; (8) papillary cystadenoma lymphomatosum; (9) carotid body tumor; (10) cystic hygroma
   B. Malignant growths: (1) mixed tumors; (2) adenocystic basal cell carcinoma; (3) epidermoid carcinoma (squamous cell carcinoma; transitional cell carcinoma; adenocarcinoma); (4) mucoepidermoid tumor; (5) lymphoma; (6) fibrosarcoma; (7) melanoma; (8) secondary metastasis

■ *Infections*

SIALADENITIS—Sialadenitis is an inflammation of a salivary gland. Nonspecific infections of the gland generally are caused by direct involvement from the oral cavity, with or without the formation of calculi (sialolithiasis).

The functional capacity of the salivary glands generally precludes the entrance of foreign material (including bacteria) into the ducts, because of the outward flow of secretion.

The zone of transition between stratified squamous epithelium of the oral mucosa and the cuboidal epithelium of the duct is vulnerable to traumatic and inflammatory stimuli which may result in metaplasia of the ductal epithelium that tends toward the squamous type. In such a circumstance, desquamated cells and other debris may enter and produce infection, stenosis or both.

The clinical features will vary according to the stage of inflammation, whether acute, subacute or chronic.

Most frequently the first signs are swelling, redness and pain in the region of the orifice of the excretory duct. The acute response is characterized by swell-

ing of the gland with a feeling of pressure. The pain is dull and throbbing at first, but may become sharp and intense as the gland is injured. Pus may form, increasing the pressure and discomfort. Temperature may be elevated and the gland extremely tender.

In the chronic infections, which usually develop when the obstruction comes about slowly, as in the formation of a stone, swelling of the gland is slow and pain is not great except at mealtimes. Gradually the gland becomes hard and unyielding as fibrosis occurs.

Spontaneous infections in the absence of calculus may subside of their own volition. If residual swelling persists because of fibrosis, surgical removal of all or a portion of the gland is indicated.

Salivary stones should be surgically removed if they cannot be manually expressed.

SIALODOCHITIS – Sialodochitis is an inflammation of a salivary duct. Its etiology is the same as that of sialadenitis, and its clinical features are the same as in early sialadenitis.

Inasmuch as sialodochitis usually is associated with sialadenitis, the treatment is the same. Some authors advocate probing the duct; however, this should be done with great care. Other authorities believe that probing is contraindicated.

TUBERCULOSIS—Tuberculosis is an infectious disease caused by mycobacterium tuberculosis. The acid-fast bacilli may come either from man or from cattle; the human source is more important.

Generally, the clinical aspects are quite similar to those of the chronic nonspecific sialadenitis. Often tuberculosis is suspected only when the disease fails to show evidence of subsiding. It is characterized by tubercles in the tissue which may ulcerate. Then the lesion usually has a roughened, ulcerous, moth-eaten appearance. It is not clear whether the lesions begin as tubercles beneath the epithelium, which are followed by desquamation, or as necrotic patches with subsequent formation of tubercles at their bases and edges.

Treatment consists of administration of streptomycin, para-aminosalicylic acid and isoniazid along with bed rest.

SARCOIDOSIS—Sarcoidosis is a chronic granulomatous disease characterized by small epithelioid tubercle-like lesions that occur in any organ or tissue. Its etiology is unknown.

Many patients have no symptoms at all; however, malaise, fatigue and slight temperature elevation may be present. Lymph node involvement usually is asymptomatic and painless unless pressure on neighboring organs is produced. No specific treatment is known.

ACTINOMYCOSIS—Actinomycosis is a chronic, granulomatous disease, local or systemic, with a tendency to produce multiple draining sinuses. It is caused by infection with actinomyces bovis (the ray fungus), a gram-positive anaerobic organism that may be present naturally on the gingiva, tonsils and teeth of persons with poor oral hygiene. The most common portal of entry to the tissues is believed to be decayed teeth. It is transmitted by vegetation that has been contaminated by the fungus from infected cattle.

Usually a small flat, hard swelling with or without pain appears first under the mucous membrane of the mouth or throat or there is a subperiosteal swelling of the jaw. Subsequently, regions of softening appear and develop into sinuses and fistulas that produce a characteristic discharge containing "sulfur granules." Other parts of the head may be affected primarily or by extension.

Treatment consists of extensive and repeated surgery. Fistulous tracts must be completely excised. Sulfadiazine and penicillin are helpful and potassium iodide is of value as a supplement to chemotherapy in promoting resolution and absorption of granulomatous tissue. Roentgenotherapy helps to promote healing.

EPIDEMIC PAROTITIS — Epidemic parotitis is an acute, contagious viral disease which usually causes painful enlargement of the salivary glands, most commonly the parotid; after puberty, the testes or ovaries, the central nervous system, pancreas or breasts may be involved.

The virus of mumps is present in the saliva and is probably transmitted by contact or droplet infection. A two to three week incubation period precedes the local lesions.

The condition is most common in children between the ages of 5 and 15 years. The prodromal symptoms are headache, anorexia, and generalized malaise with slight elevation of temperature.

Pain on chewing or swallowing is usually the first symptom of parotitis. It is aggravated by swallowing acid liquids such as vinegar or lemon juice only when the parotid duct is obstructed by edema. The patient exhibits considerable sensitivity to pressure over the angle of the jaw. The swelling of the gland is maximal approximately the second day. In most instances both parotid glands are involved. Occasionally the submaxillary and sublingual glands may be swollen or more rarely may be the only glands affected. In such instances there is swelling of the neck beneath the mandible.

The complications which may develop are (1) orchitis; (2) meningoencephalitis—headache, drowsiness, nausea and vomiting; and (3) pancreatitis—nausea, vomiting, and abdominal pain.

Treatment is purely symptomatic—bed rest until afebrile. Local application of hot and cold may be prescribed as well as mouthwashes and soft diet.

MIKULICZ'S DISEASE—Mikulicz's disease is a chronic enlargement of the salivary and lacrimal glands due to replacement of the glandular tissue by lymph cells. Its etiology is unknown.

The condition is characterized by benign, painless enlargement of these glands from infiltration by masses of lymphoid element. No treatment is recommended.

■ *Developmental Disturbances*

ABERRANT GLAND OR TISSUE—There may be one or more accessory or secondary glands. These are formed from sprouts given off from the main epithelial strand which later forms the duct. No treatment is necessary.

ATRESIA OF SALIVARY DUCT—Imperforation, the absence or closure of a normal opening, occurs rarely but may be the cause of cyst formation.

DISPLACEMENT AND FUSION OF THE GLANDS—Fusion occurs most frequently in the sublingual and submaxillary glands.

DERMOID CYST—The dermoid cyst is lined by stratified squamous epithelium and has in its wall one or all ectodermal appendages such as hair follicles, sweat glands, sebaceous glands and teeth. Clinically, it is manifested as a simple swelling of the neck, usually occurring in the submental region. Treatment is by surgical excision.

BRACHIAL CLEFT CYST—Brachial cleft cysts arise from the inclusion of either ectodermal or endodermal remnants of the brachial arches and therefore may be lined by stratified squamous epithelium or pseudostratified ciliated columnar epithelium. Clinically, it is a painless fluctuant swelling either on the lateral aspect of the neck or in the floor of the mouth. It is never in the midline. Treatment is by surgical excision.

THYROGLOSSAL DUCT CYST—Thyroglossal duct cysts are retention cysts arising from partial persistence of the thyroglossal duct which extends from the foramen caecum downward through the hyoid bone, terminating in the deep fascia in the region of the thyroid isthmus. Clinically, they are fluctuant swellings near the midline. Spontaneous rupture of the cyst results in draining sinuses which require extensive surgery for complete cure.

EPIDERMOID CYST—The epidermoid cyst differs from the dermoid cyst only by having no ectodermal appendages in its wall.

■ *Nondevelopmental Cysts*

RETENTION CYST—Obstruction of any of the glands or ducts that abound in the oral region may result in a retention phenomenon. They appear as elevated glistening swellings with a bluish tinge. The ranula presents a typical clinical appearance. Being a larger cyst, its thinned-out mucosal covering gives it the "frog-belly" appearance.

In treatment, the smaller lesions can be removed in toto, but in some of the larger cysts, it may be well to remove the covering and suture the oral epithelium to the cyst lining.

INCLUSION CYST — Inclusion cysts are identical to epidermoid cysts except the epithelial remnants were inserted by trauma. Some authors call them all epidermoid cysts whether developmental or traumatic.

■ *Neoplasms*

BENIGN GROWTHS — Benign neoplasms are as follows:

Mixed Tumor—A mixed tumor is composed of more than one type of neoplastic tissue. It is most common in the parotid gland and occurs at almost any age but more commonly between the fourth and seventh decade. Swelling is common, being smooth and painless in the preauricular, postauricular or the cervical region. This tumor may impinge on nerve structures and produce intermittent pain or paresthesia. Treatment consists of surgical removal but the percentage of recurrence is high.

Adenoma—An adenoma is an epithelial tumor with a glandlike structure. It can arise outside of the salivary gland

proper, since the inclusion of ducts in tissues removed from, but adjacent to, the larger glands is a rather common occurrence. They are slow-growing tumors and are seldom found in patients under 50 years of age, and may produce swelling if located near surface structures. Pain as a primary symptom is rare. Treatment is by surgical removal.

Mucoepidermoid Tumor—A mucoepidermoid tumor is composed both of mucous and epidermoid cells. These tumors apparently have their origin in ductal epithelium, metaplasia playing an important role. The most common symptom is painless swelling. They occur rarely in people under 40 years of age. Treatment consists of surgical removal.

Hemangioma — A hemangioma is made up of newly formed blood vessels. Most of them strongly suggest congenital abnormalities, frequently of the cavernous form. Their size is variable and they are not usually discovered until clinical swelling is apparent. They occur most frequently in the skin of the face and neck. Their treatment is influenced by a number of factors, such as size, location and symptoms.

Neurofibroma—Tumors of the nerve sheaths are sometimes seen in the salivary glands either as solitary nodules or as a part of a generalized neurofibromatosis (Von Recklinghausen's disease). Sizable lesions have been reported when pain and tenderness are likely. Treatment is influenced by the size, location and symptoms.

Neuroma—As in other regions, the neuroma of the submaxillary gland is associated with trauma. An amputation neuroma may develop after surgical procedures for removal of any tumor from the major salivary glands, but it is most common in the region of the mental foramen. The lesion is a bulbous enlargement which occurs at the ends of nerves when they are divided, brought about by active proliferation of Schwann cells and the nerve sheaths. Treatment is by surgical removal which depends largely on the location of the mass and whether or not it is producing symptoms. Removal may be the only choice. Alcohol injections are worth while in selected instances when the surgical approach is difficult.

Lipoma—A lipoma is a tumor of fat cells. Swelling is prominent and there is occasional pain. Although this tumor is slow-growing, it may reach alarming proportions. It is a light yellow spherical enlargement which is soft to palpation. Treatment is by surgical removal.

Papillary Cystadenoma Lymphomatosum—The name, papillary cystadenoma lymphomatosum, is descriptive of the histologic appearance of this tumor. It has a lymphoid stroma, and the epithelial parenchyma forms tubules and lines cystic spaces, which have papillary projections.

It is believed that this tumor arises from parotid ductal epithelium included in lymph nodes. It appears as a slow-growing hard, nontender, lump over the angle of the mandible or behind the ear and occurs more frequently in males than females. Its highest incidence is in persons in the fifth decade of life. Treatment is by surgical removal.

Carotid Body Tumor—The carotid body tumor is a rare, peculiar growth appearing in persons between 20 and 60 years of age. It is a slow-growing swelling of variable size in the neck next to the

bifurcation of the carotid artery and usually is unilaterally lobulated and transmits pulsations. It is freely movable horizontally but not vertically, and relatively benign but tends to recur locally after surgical removal and may extend into the adjacent tissue.

Cystic Hygroma—The cystic hygroma is a cystic type of lymphangioma which consists of numerous large lymph-filled, noncommunicating spaces lined with endothelium. This anomaly may be present at birth but may not develop to a noticeable degree until several months thereafter. It may be of such size that it impairs swallowing and breathing. The tumor is produced by growth, dilatation and coalescence of embryonic lymph sacs in the neck; in some instances it extends into the mediastinum. Treatment is by surgical removal.

MALIGNANT GROWTHS — Malignant neoplasms are as follows:

Mixed Tumor—The malignant form of mixed tumor is the same as the benign lesion except there is invasion with questionable metastases.

Adenocystic Basal Cell Carcinoma—The adenocystic basal cell carcinoma is seen most frequently on the palate where it arises in the palatal glands. It rarely occurs in major salivary glands. It is seen in persons between 21 and 47 years of age. Considerable invasion of bone results and metastasis is a likely possibility. The prognosis is poor. Surgical removal is possible when the tumor is still small and encapsulated. Roentgenotherapy is of limited benefit.

Epidermoid Carcinoma—The three types of epidermoid carcinoma are:

Squamous Cell Carcinoma. The diagnosis of squamous cell carcinoma in this location is based on the same criteria as are used to identify the lesion in any location. It may develop from a mixed or mucoepidermoid tumor directly from ductal epithelium. Treatment is by surgical removal.

Transitional Cell Carcinoma. The transitional cell carcinoma is an epithelial neoplasm, also known as lymphoepithelioma. It occurs rarely in the salivary glands. It arises from ductal epithelium, through metaplasia, in regions where lymphoid tissue is most frequently seen in the nasopharynx. Treatment is by radiation.

Adenocarcinoma. The adenocarcinoma is usually a sessile, lobulated growth arising from glands. It is more commonly noted in the major salivary glands, particularly the parotid and usually metastasizes early, particularly to the cervical lymph nodes. Treatment consists of extensive surgical procedures.

Mucoepidermoid Tumor. The malignant form of mucoepidermoid cyst is the same as the benign form except it occurs in older persons, and pain is a more frequent symptom because of its aggressive character and because growth may be more rapid. Surgical treatment is indicated with possible radical neck dissection.

Lymphomas. The term, lymphoma, as employed here, includes the reticulum cell sarcoma, lymphosarcoma and Hodgkins disease, and is an inclusive term for neoplasms arising from lymphoid tissue. All varieties of malignant lymphoma are invariably fatal, multicentric in origin, and are characterized clinically by enlarged lymph nodes. Generally, treatment is not

satisfactory. Surgical intervention, either alone or combined with radiation, is sometimes beneficial. Nitrogen mustard is believed by many to be of value, especially in obtaining periods of remission.

Fibrosarcoma. The fibrosarcoma is a malignant neoplasm consisting of fibroblasts which is extremely rare in the salivary glands. It may arise from the periosteum or from extraosseous soft tissue. Generally, it is relatively slow-growing, but sometimes is large and infiltrating, leading to early metastasis and death. Surgical removal of the neoplasm is the treatment of choice.

Melanoma. The melanoma is composed of malignant melanoblasts which have the capacity to produce melanin pigment. They do not, however, always do so, hence the amelanotic form. As a rule, melanomas develop from the pigmented mole, particularly the dermal-epidermal type. Rare instances of melanoma in the salivary glands are known to have occurred. Generally, the lesion is flat or slightly elevated with a rugose surface. The color may vary from black to reddish-brown. Radical surgery is the treatment of choice. Incision into this tumor should be avoided because of its vascularity and aggressiveness. Prognosis is very poor.

Secondary Metastases. Those tumors which are most likely to metastasize to the submaxillary gland region from distant or nearby regions are: (1) carcinoma of lungs; (2) carcinoma of breast; (3) carcinoma of prostate; (4) carcinoma of nose and paranasal sinuses; (5) tumors of thyroid gland; (6) carcinoma of gastrointestinal tract; (7) melanoma; (8) Ewing's tumor; (9) myeloma; (10) malignant lymphoma; (11) osteogenic sarcoma.

■ *Surgical Anatomy*

The submaxillary gland is irregularly shaped and varies considerably in size and contour. The gland is located mainly within the digastric triangle on the side of the neck and under the mylohyoid muscle and the body of the mandible. The posterior portion of the gland extends around the posterior border of the mylohyoid muscle and overlies the mylohyoid and the hyoglossus muscles. In some instances the submaxillary gland approximates the sublingual gland and the enveloping fascia of each is contiguous.

The inferior lateral surface of the gland is covered with a capsule of loosely attached cervical fascia. The deep fascia, platysma muscle, superficial fascia and the skin overlie the lateral surface of the gland. The superior lateral surface of the gland rests against the submaxillary fossa on the inner surface of the body of the mandible and contacts the lower portions of the internal pterygoid muscle.

The stylomandibular ligament separates the posterior surfaces of the gland from the medial portion of the parotid gland. The facial artery forms an indentation on the gland's posterior lateral surface. The upper medial surface of the gland lies against the under-surface of the mylohyoid muscle and the gland body also contacts the posterior belly of the digastric, the stylohyoid, and the hyoglossus muscles. The submental artery and the mylohyoid nerve pass between the gland capsule and the mylohyoid muscle in this region (Fig. 1, 2).

The submaxillary duct, or Wharton's duct, is about 5 mm. long and has a thin wall. It begins with numerous branches from the deep surface of the gland, goes

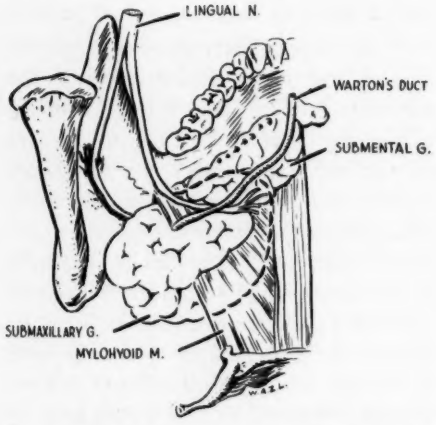

Fig. 1—Surgical anatomy of submaxillary gland viewed from above and behind the mandible

upward and forward into the floor of the mouth and opens by a narrow orifice on a summit of a small papilla, at the side of the frenulum linguae. As the duct traverses the floor, it usually lies immediately beneath the mucous membrane. It runs in immediate medial relationship to the lingual nerve. Surgical exposure for its entire length, including the hilus of the gland when it is above the mylohyoid muscle, can be accomplished easily by a linear incision from the posterior portion of the partially extended and elevated tongue in the mucous membrane trough between the plica sublingualis and the inferior lateral surface of the tongue. The sharp incision should divide the full thickness of the mucous membrane. On occasion in the oral dissection, it is found that the submaxillary and sublingual ducts are commonly joined in their anterior quarter. Blind, deep sharp incisions are hazardous and should be avoided. The arteries supplying the submaxillary gland are branches of the facial and the lingual arteries; the veins follow the arteries. The nerves come from the submaxillary ganglion, through which the submaxillary gland receives branches from the chordi tympani and the lingual nerves.

In reviewing the surgical notes on six instances of submaxillary gland excisions accomplished over the last year by the department of oral surgery, USAF Hospital, Lackland, Lackland AFB, Texas, it has been found that the surgical anatomy of the submaxillary gland often varies greatly from what is considered the normal as described in standard anatomy texts. Vascularity may vary from one patient to another. Two of the six patients had numerous accessory blood vessels in the operating field which produced more operative hemorrhage than is generally encountered. In several of the patients only the anterior facial vein and the facial artery were present in the operative field and the submaxillary gland was relatively avascular.

It has been our experience that the facial artery and anterior facial vein should be sacrificed when they are in the immediate surgical field. Generally it is most difficult to retract these vessels and remove the gland. It should also be noted that in some patients the artery passes through the substance of the gland and that careful dissection is mandatory.

In one patient the submaxillary gland was in the shape of a crude hour glass with the most constricted portion lying immediately over the intermediate tendon of the digastric muscle. The entire lower portion of the gland was found to be inferior to the intermediate tendon of the digastric muscle. No portion of the gland was superior to the mylohyoid

muscle and the anterior facial vein was superior to its usual position.

In patients who have had long standing chronic infection of the submaxillary gland it is often very difficult to find planes of dissection in the deep tissues because of excessive fibrosis resulting from the infection.

In two patients of this series, it was noted that the anterior portion of the submaxillary gland was in intimate contact with the sublingual gland. This may present some difficulty in determining the limit of the surgical anatomy of the submaxillary gland.

In another patient the lingual nerve was lying directly on the superior portion of the gland. It should be recognized that the surgical anatomy can vary considerably from one patient to another and that careful dissection and sound surgical technic are of prime importance.

Thoma[1] states that excision of the submaxillary gland is indicated if multiple stones are present in the gland proper which obstruct the ducts and cause a painful swelling.

■ *Report of Case*

A white USAF airman, 25 years of age, was admitted to the oral surgery service of the 3700th USAF Hospital (now designated the USAF Hospital, Lackland) on June 12, 1957 for evaluation and treatment of an intermittent swelling in the left submaxillary region.

COMPLAINT AND HISTORY OF PRESENT ILLNESS—The patient complained that he had experienced episodes of swelling and

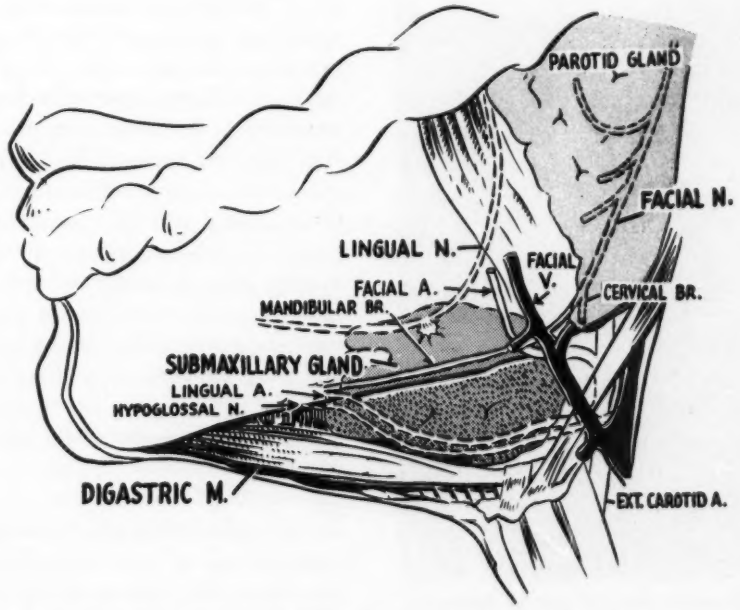

Fig. 2—Surgical anatomy of submaxillary gland viewed from lateral aspect

pain in the left submaxillary region for the past six months. The swelling occurred approximately two to three minutes after the start of a meal, and gradually subsided 20 to 30 minutes after he had finished eating. During the period of swelling, the left submaxillary region was tender to palpation and moderate pain was produced on swallowing.

EXAMINATION—Examination of the patient's face and neck revealed no unusual swellings or masses of the left submaxillary region until food was eaten. The patient was given a dill pickle to eat, and two minutes after a 6 cm. mass appeared in the left submaxillary region which was tender to palpation (Fig. 3). As the mass increased in size, swallowing became more difficult and painful. The mass had completely disappeared 25 minutes after the patient had finished eating the pickle.

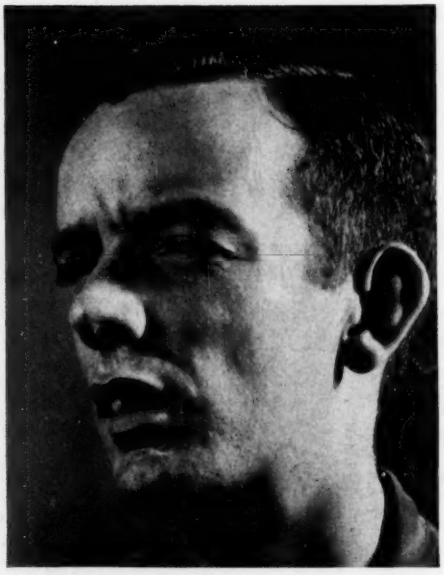

Fig. 3—Preoperative view of patient demonstrating enlargement of left submaxillary gland

Fig. 4—Lateral jaw view showing submaxillary gland and calcifications

The intraoral examination did not reveal any contributory dental pathologic condition; the floor of the mouth on both right and left sides felt normal on palpation, and no swellings or masses could be felt. The remainder of the physical examination was noncontributory.

Intraoral roentgenograms of the patient's teeth were negative for infection. Roentgenograms of the left submaxillary area showed a 1 cm. round calculus at the central area of the submaxillary gland and a second stone near the hilus (Fig. 4).

Roentgenograms of the chest were negative.

GENERAL PHYSICAL FINDINGS—The patient was a well developed, well nourished, tall, slender young man who was in no acute distress. The remainder

of the physical examination as well as laboratory reports were essentially normal.

TREATMENT AND COURSE—The patient was placed on routine hospital care and supportive treatment during the time of the physical evaluation and workup.

On June 25, 1957 an excision of the left submaxillary gland was accomplished under general anesthesia in the operating room.

OPERATION—Under nasoendotracheal anesthesia the skin of the face and neck was surgically prepared with surgical detergent and draped to expose the left submaxillary region. Fifteen cubic centimeters of 2 per cent procaine hydrochloride solution with a 1:60,000 epinephrine content were infiltrated into the skin and subcutaneous tissues around the operative site to aid in the control of hemorrhage. A 10 cm. incision was made through the skin and subcutaneous tissues 2 cm. below and parallel to the inferior border of the left side of the mandible (Fig. 5).

The incised skin and subcutaneous tissue were retracted and the superficial fascia and platysma muscle were sharply incised and reflected to expose the deep fascia. The unusually large external jugular vein can be seen in Figure 6. The mandibular branch of the facial nerve was located and isolated (Fig. 7). By alternate sharp and blunt dissection, the deep fascia was divided to expose the outer surface of the submaxillary gland. The anterior facial vein and artery were identified, ligated, sectioned, and retracted free of the operative field (Fig.

Fig. 5—Incision through skin

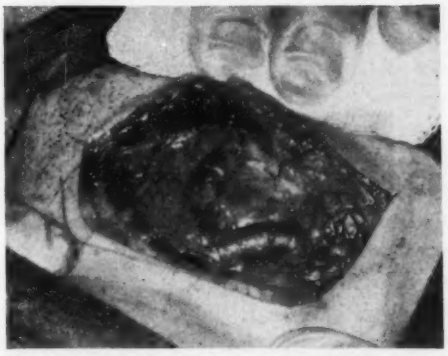

Fig. 6—Dissection of superficial tissues through platysma. Note unusually large external jugular vein

Fig. 7—Dissection of deep tissues and isolation of mandibular branch of facial nerve (rubber band and scissors)

8). The gland was carefully freed from its surrounding fascial envelope (Fig. 9). Enucleation of the gland was completed and Wharton's duct and the lingual nerve identified and dissected free (Fig. 10). A ligature of no. 000 silk was passed upward around the salivary duct as far as could be reached and tied. The submaxillary duct was then sectioned just proximal to the ligature and the submaxillary gland removed (Fig. 11). The wound was then closed in layers using no. 00 chromic gut for the deep fascia, no. 000 plain gut for muscle, and the subcutaneous layers and the skin were closed with no. 0000 black silk. At the conclusion of the operation, the wound was totally dry. A collodion tape dressing was placed on the skin incision over which a pressure bandage was utilized to control postoperative edema. Estimated blood loss in this procedure was 100 cc. The patient received 1,000 cc. of 5 per cent dextrose in water during the operation. He tolerated the procedure well and was returned to the recovery ward in good condition. The excised salivary gland was sent to the pathologist for examination (Fig. 12).

POSTOPERATIVE TREATMENT — The patient's postoperative recovery and convalescence were uneventful and without complication. On June 26, 1957 the patient had recovered fully from his anesthetic and was ambulant. The postoperative swelling and edema were minimal. On June 28, 1957 the pressure bandage was removed. The postoperative swelling of the left submaxillary region had almost entirely subsided, and the wound was healing satisfactorily. On July 1, 1957 the sutures were removed, and the skin showed evidence of excellent healing with minimal scarring. On July 9, 1957 the patient was discharged from treatment.

PATHOLOGIC EXAMINATION — The gross examination showed that the specimen consisted of a 4 cm. by 3.5 cm. by 2 cm. lobulated salivary gland with a large dilated duct. In the body of the gland there was a fine granular yellow-colored stone measuring 0.8 cm. by 0.5 cm.

Microscopic examination of the submaxillary gland revealed the main duct to be dilated and filled with secretions and some mononuclear cells. There was edema of the surrounding tissue and diffuse infiltration of chronic inflammatory cells, chiefly lymphocytes, with a scattering of plasma cells. There were similar foci of inflammatory cells surrounding the smaller ducts.

The pathologist's diagnosis was sialolithiasis with sialadenitis of the left submaxillary gland.

Postoperatively the patient was free from pain and swelling during eating. The skin incision had healed well with minimal scarring. He experienced no untoward effects from the operation.

■ *Conclusions and Comments*

Swellings of the neck in the submaxillary region may be caused from infections, developmental disturbances, cysts or neoplasms. A careful history, examination, and adequate roentgenograms will help to differentiate these conditions one from the other.

The surgical anatomy can vary extensively from what is considered normal as published in the standard anatomy texts.

Figure 8 Capsule of the submaxillary gland exposed. Facial nerve isolated and retracted with rubber band. Hemostat on right indicates the facial vein crossing the lateral portion of the submaxillary gland

Figure 9 Lateral aspect of the gland dissected free

Figure 10 Gland enucleated and Wharton's duct isolated and retracted with rubber band on left. The center rubber band identifies the lingual nerve

Figure 11 Submaxillary gland removed demonstrating the deep structures investing the space originally occupied by the gland

When stones are found within the substance of the salivary gland, surgical excision of the gland is the most expeditious and satisfactory method of treatment.

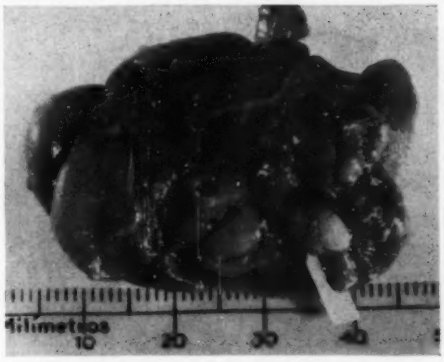

Fig. 12—Submaxillary gland showing stone

■ *Reading List*

Bernier, J. L. Management of oral disease. St. Louis, C. V. Mosby Co., 1955.

Burrows, W. Jordan-Burrows' textbook of bacteriology, ed. 15. Philadelphia, W. B. Saunders Co., 1949.

Cecil, R. L., and Loeb, R. F. Textbook of medicine, ed. 9. Philadelphia, W. B. Saunders Co., 1955.

Foote, F. W., Jr., and Frazell, E. L. Tumors of the major salivary glands. Atlas of tumor pathology, Sect. 14, Fasc. 11. Washington, D. C., Armed Forces Institute of Pathology, 1954.

Gray, Henry. Anatomy of the human body, ed. 26. Philadelphia, Lea & Febiger, 1954.

Schaeffer, J. P., editor. Morris' Human anatomy, ed. 11. New York, Blakiston Co., 1953.

Shafer, W. G.; Hine, M. K., and Levy, B. M. Textbook of oral pathology. Philadelphia, W. B. Saunders Co., 1958.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Department of the Air Force or the Air Service at large.

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1. Thoma, K. H. Oral surgery, vol. 2, ed. 3. St. Louis, C. V. Mosby Co., 1958, p. 1,022.

■ Art of Healing

Hypnosis . . . is in one of its periodic revivals. Better than trying to put the patient into a trance, is unplanned "suggestion," faith and confidence inspired in the patient by the kind of man his physician or dentist is, and an instinctive rapport between the two. Methods of treatment which ordinarily succeed fail when doctor-patient understanding is absent; less certain therapies work well when trust prevails. This is not a technic to be studied, a set of rules to learn. It is an art to be developed. Some men have a natural "bedside manner," and people love and trust them. Others annoy and make sympathetic understanding difficult. The doctor who possesses this quieting power needs far less aid from anesthetics and drugs. *He* is the remedy.—*A. B. Riffle. The Mouth: Its Clinical Appraisal; Anesthesia, Drugs, Diet and Nutrition. American Practitioner and Digest of Treatment, February, 1959.*

Incidence of osteosclerotic areas in the mandible and maxilla

■ *Philip J. Boyne,* D.M.D., Washington, D. C.*

A survey of 927 full mouth roentgenograms of male patients between the ages of 22 and 56 revealed that 39 exhibited areas of localized osteosclerosis. Biopsy specimens were obtained in 21 of these patients. Twenty specimens confirmed the roentgenographic and clinical diagnosis of osteosclerosis, and one specimen revealed a cementoma. On the basis of this study, there is an incidence of 22 cases per 1,000 in the age group observed, or if the diagnosis in the additional 18 cases, which were not studied histologically, is correct, a predicted incidence of 4 per cent in the 22 to 56 age group.

In the response of osseous tissue to various inflammatory or traumatic stimuli, imbalances in the equilibrium between bone formation (osteoblastic activity), and bone destruction (osteolytic activity) may occur, resulting in areas of decreased or increased bone density.[1] One manifestation of such a disturbance may be observed in localized areas of osteosclerosis in the mandible and maxilla.[2] Such areas, appearing roentgenographically in the form of radiopacities, have been variously termed: condensing osteitis,[3-6] osteosclerotic areas,[5] sclerosing osteitis,[7] bone whorls,[5,6] bone eburnation,[5,6] enostosis,[1,5] bone sclerosis,[4,5] chronic productive osteitis, and chronic focal sclerosing osteomyelitis.[8,9]

In addition to the confusion in terminology regarding the nature of this clinical entity, there is frequently the problem of differentiating between this condition and other common radiopacities of the jaws, for example, cementomas, osteomas and retained root fragments.[1] Although there have been reports in the literature concerning the incidence of other radiopaque conditions such as cementoma,[10] there has been little published material relative to the incidence of localized areas of increased bone density in the mandible and maxilla. This study was undertaken in an effort to evaluate histologically biopsy material taken from bone areas previously diagnosed on the basis of roentgenograms as "areas of osteosclerosis," and to determine the incidence of histologically proved cases of this condition in the group of patients observed.

A survey was made of 927 full-mouth roentgenograms of male patients between the ages of 22 and 56, the mean age being 36 years. Thirty-nine of these patients had localized areas of radiopacity which

were diagnosed on the basis of roentgenograms as localized osteosclerosis. Some of the patients had more than one such area, making a total of 70 separate "lesions." Biopsy specimens were obtained of these radiopaque regions in 21 patients. These hard-tissue specimens were taken by means of trephine, mallet and chisel, and bone bur. The tissue specimens were prepared by C. W. Miller, Naval Medical Research Institute. The tissues were fixed in 10 per cent neutral Formalin, and hematoxylin and eosin-stained sections of decalcified specimens were obtained.

In order to avoid confusion of terminology and to simplify the diagnosis of the microscopic sections, the term "osteosclerotic area" was applied if the predominating histologic picture was one of a mass of bone trabeculae of much denser arrangement than the surrounding osseous tissue, or a mass or island of compact bone existing within the normal anatomic locus of spongiosa. Although it was recognized that the histologic responses being observed were in all probability reflecting a stage in a chronic sclerosing osteomyelitic process of the focal type,[8] the general term "osteosclerotic area" was used in this study.

Twenty of these specimens confirmed the roentgenographic and clinical diagnosis of osteosclerosis, whereas one of the specimens revealed the presence of a cementoma.

The predominant histologic characteristic demonstrated in these specimens was an obliteration of the normal marrow spaces by heavy trabeculation leading in most instances to the formation of areas of compact bone. The latter varied in size from isolated islands to rather extensive areas of solid cortical bone that were sharply demarcated from the surrounding normal cancellous structure. Inflammatory elements were minimal or nonexistent in the reduced marrow spaces. The existing marrow spaces contained loose vascular fibrous connective tissue.

In the 21 patients from whom biopsy specimens were taken, the areas of radiopacity varied from 10 mm. (Fig. 1, left) to 30 mm. (Fig. 2, above left) in length or width as measured from periapical roentgenograms taken with a standardized technic. Instances in which the areas of increased bone density were smaller than 10 mm. (Fig. 1, right) were not included in this study. The outline of these lesions as viewed in roentgenograms varied from sharply circumscribed, clearly defined masses of radiopacity (Fig. 2, above) to radiopaque areas with irregular peripheries (Fig. 3, left). The simultaneous existence of osteosclerotic ond osteolytic processes was noted in four instances (Fig. 3, left).

Of the 70 separate radiopaque areas, only ten were definitely associated with existing apical pathologic conditions (Fig. 3, left). An additional five areas were found to be adjacent to apexes of vital teeth exhibiting no pathologic change. The remaining areas were located in edentulous regions, and their association, if any, with previously existing periapical disease could not be determined from oral examination or the case histories (Fig. 1, left). Complete physical examinations of the patients in this group had been undertaken within 12 months of the oral examinations, and all were essentially negative. Physical examinations which were repeated in 12 instances, and hematological

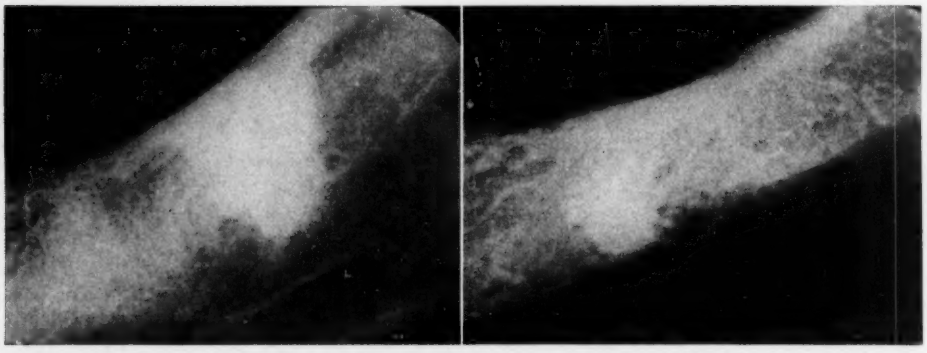

Fig. 1—Left: View showing area of radiopacity in edentulous region of mandible. Area is representative of smallest radiopaque "lesion" in this study. Right: View showing small bone whorl considered below minimal limits for use in this study

diagnostic studies, failed to disclose any systemic basis for the sclerotic bone areas. Of the total number of cases, only two involved the maxilla.

■ *Case 1*

A 25 year old, white Navy petty officer reported to the dispensary, Navy Department, Washington, D. C., on September 1, 1956, for routine dental treatment. Bitewing roentgenograms partially demonstrated an area of radiopacity in the edentulous area of the mandibular left first molar. The patient stated that this tooth had been extracted eight years previously because of an "abscess." Healing had been uneventful, and the patient at the time of the examination was asymptomatic. The remainder of the past history was noncontributory. Periapical and extraoral lateral oblique roentgenograms (Fig. 2, above) revealed a large, clearly demarcated radiopaque mass extending from the crest of the alveolar ridge between the mandibular left second bicuspid and the second molar nearly to the inferior border of the mandible. Oral examination failed to demonstrate any enlargement or other abnormality of the alveolar processes. The general physical examination was essentially negative.

On September 7, with the patient under local conduction and infiltration anesthesia, a biopsy specimen was taken of the dense bone tissue which at operation appeared to make up the mass of the "lesion." The specimen was taken at the distal border of the mass in order to obtain a portion of the normal osseous tissue at the periphery of the lesion for histologic comparison (Fig. 2, below left).

Histologic examination of the specimen revealed dense compact bone with irregular incremental lines (Fig. 2, below right). In some areas constricted marrow spaces were present. These spaces contained loose fibrous connective tissue with no evidence of inflammatory cellular elements. No further treatment was considered necessary.

■ *Case 2*

A 28 year old white Naval officer reported to the dispensary, Navy Depart-

ment, on August 1, 1956, with the complaint of pain and swelling in the mandibular right molar region. The patient stated that he had experienced recurrent swelling with spontaneous remissions in this region for the past year. He had not sought treatment for this condition. The remaining history was noncontributory.

Oral examination revealed a swelling of the soft tissue in the mucobuccal fold opposite the mandibular right first molar. The first molar possessed a large MOD amalgam restoration, and the response of this tooth to the electric pulp tester was negative. Roentgenograms demonstrated an area of radiolucency surrounding the distal root of the mandibular first molar, and an irregular area of radiopacity involving the mesial root and extending inferiorly to blend with the cancellous bone. The general physical examination was essentially negative.

On August 2, while the patient was under local conduction and infiltration anesthesia, the mandibular right first molar was extracted. The mucoperiosteum was elevated, and the soft tissue surrounding the distal root was removed. This mass

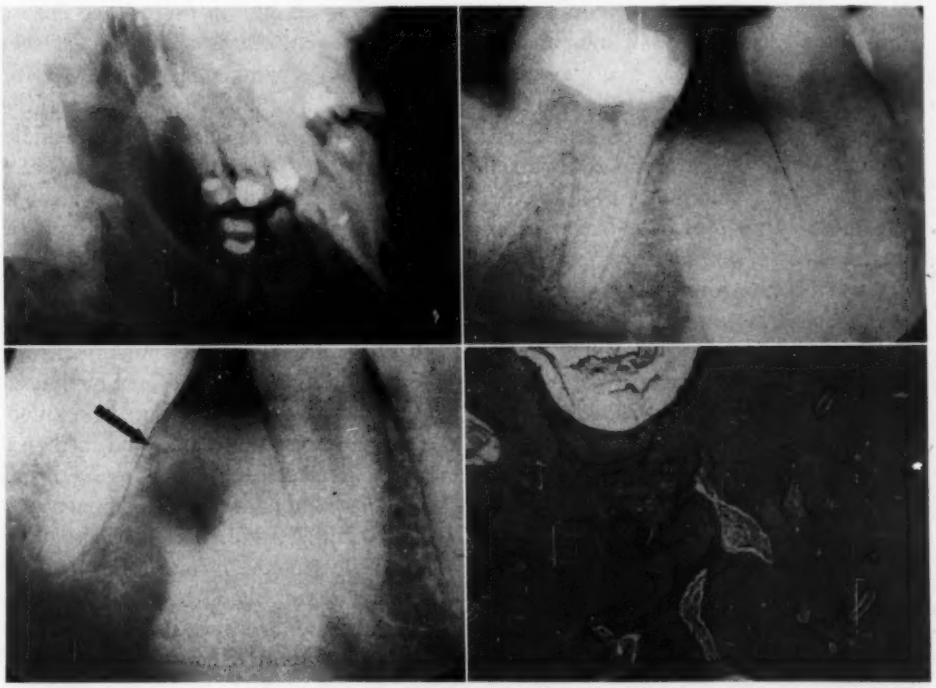

Fig. 2—Case 1. Above left: Lateral oblique view showing well-demarcated radiopaque area. Above right: Periapical view showing density and sharply demarcated periphery of radiopaque mass shown at left. Radiopaque area does not appear to involve adjacent teeth. Below left: Postoperative view showing area from which biopsy specimen was taken. Below right: Photomicrograph of osseous tissue taken from area shown at left. Note compact bone with irregular incremental lines

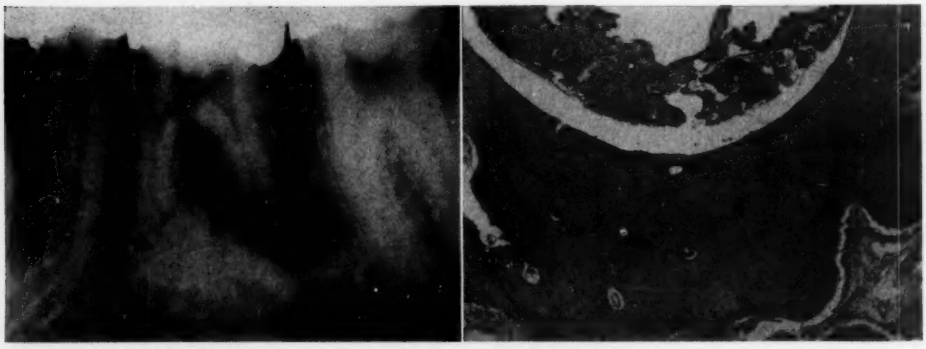

Fig. 3—Case 2. Left: Periapical view demonstrating simultaneously existing areas of radiolucency and radiopacity. Arrow indicates region from which hard-tissue specimen was taken

of soft tissue appeared granulomatous. A portion of the dense bone surrounding the mesial root was removed with a mallet and chisel (Fig. 3, left). The postoperative course was uneventful, and no further treatment was undertaken. Histologic evaluation of the specimen revealed the presence of a granuloma involving the distal root and the bifurcation of the tooth. The hard tissue specimen was composed of compact bone with numerous, irregular cement lines (Fig. 3, right). There were no inflammatory cells within the small marrow spaces. A concavity was present along one margin of the specimen, containing an amorphous mass of material resembling cementum. This latter mass was immediately adjacent to the root of the molar and perhaps represented a cemental reparative process.

■ *Discussion*

Localized areas of osteosclerosis in the jaws appear to be a defense mechanism of the bone tissue against irritation or infection.[1,3]

Localized areas of osteosclerosis have been described as the result of a particular type of sensitivity on the part of the individual to the effects of an irritation that occurs over a period of time.[11] This tissue response is described as an increase in the osteoblastic activity of the marrow cellular elements. According to Bauer and Main,[11] this abnormally dense apposition of bone tissue appears to resemble the hyperplastic scar tissue of the keloid formation. Other investigators[1,12] have noted that osteosclerosis is indicative of increased mechanical function, for example, sclerotic bone deposition around roots of teeth used as abutments for fixed bridgework. Osteosclerotic areas have been noted in the vicinity of healed extraction sockets[7] and surrounding retained root fragments.[4,7]

Systemic conditions[11] are more often responsible for the diffuse form of osteosclerosis rather than the localized form which is described in this study. It is generally considered that these localized areas of osteosclerosis do not require treatment.[11] Most of the surgical procedures undertaken in this study were for diagnostic purposes and were not intended to

render any therapeutic effect. In the ten instances in which the osteosclerotic areas were associated with periapical radiolucency, it was considered that eradication of the pathologic soft tissue would have been adequate treatment under ordinary circumstances.

■ *Conclusions*

The results of this study, which was based on 20 histologic specimens from a total of 927 full-mouth roentgenograms reviewed, would indicate an incidence of 22 cases per 1,000 in the age group observed. If the additional 18 cases (diagnosed roentgenographically as osteosclerotic areas but not studied histologically) are assumed to be diagnosed correctly, a predicted incidence of this condition might be in the order of 4 per cent of the population in the 22 to 56 age group. Thus, the incidence of these osteosclerotic areas would appear to be higher than that inferred by the scattered case reports in the literature.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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1. Follis, R. H., Jr. Survey of bone disease. Am. J. Med. 22:469 March 1957.

2. West, R. K. Differential diagnosis of abnormal dental radiopacities. J.A.D.A. 53:271 Sept. 1956.

3. Thoma, K. H. Oral pathology, ed. 2. St. Louis, C. V. Mosby Co., 1944, p. 664.

4. Kronfeld, Rudolf. Histopathology of the teeth and their surrounding structures, ed. 2. Philadelphia, Lea & Febiger, 1939, p. 206.

5. Archer, W. H. Manual of oral surgery. Philadelphia, W. B. Saunders Co., 1952, p. 287.

6. Wisoff, Julius. Residual infection and condensing osteitis. D. Items Interest 53:929 Dec. 1931.

7. Heiss, J. Die sklerosierende Ostitis der Kieferknochen. Schweiz. Mschr. Zahnhk. 65:714 July 1955.

8. Shafer, W. G. Chronic sclerosing osteomyelitis. J. Oral Surg. 15:138 April 1957.

9. Bell, W. H. Sclerosing osteomyelitis of the mandible and maxilla. Oral Surg., Oral Med. & Oral Path. 12:391 April 1959.

10. Stafne, E. C. Periapical osteofibrosis with formation of cementoma. J.A.D.A. 21:1822 Oct. 1934.

11. Bauer, W. H., and Main, L. R. Osteosclerosis of the jaws. J. D. Res. 20:399 Oct. 1941.

12. Weinmann, J P. Variations in the structures of bone and bones and their significance in radiology. Oral Surg., Oral Med. & Oral Path. 8:988 Sept. 1955.

■ Animal Experimentation

There is inflicted on animals more pain in one hunting, trapping and fishing season than in all the centuries of animal experimentation. The pain inflicted by the hunter, fisherman and trapper is not wanton, to be sure, and yet inevitable. For what purpose? For the most part for the joy of the chase, the possession of furs (for ornaments often), for food, or for reduction in the numbers of an animal population not helpful to man. We use animals by common consent for food, for clothing, for labor, for pleasure. How can it be wrong to use animals humanely to increase our understanding of life, our control of disease, both of which contribute to human happiness? We must retain the sense of proportion. Man survives only by destruction of plant and animal life for his food.—*Anton J. Carlson.*

The use of epinephrine in local anesthetics for dental patients with cardiovascular disease: a review of the literature

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There has been considerable concern among dentists in the past regarding the possibility of untoward effects of epinephrine in local anesthetic solutions administered to patients with cardiovascular disease. Much of the confusion exists because of statements appearing in the literature which condemn the use of epinephrine without sufficient experimental or clinical support. Actually it has been demonstrated that epinephrine increases the duration and potency of the anesthetic and prevents toxic manifestations due to the anesthetic drug itself. The total dosage used for dental procedures is much less than is needed to produce a positive pressor response, and usually is far less than is used for medical purposes. The endogenous epinephrine secreted by the patient's adrenal glands because of apprehension and pain caused by inadequate anesthesia resulting from the exclusion of the vasoconstrictor from the anesthetic solution far overshadows the amount of vasopressor in the solution.

The New York Heart Association states that 0.2 mg. of epinephrine is the maximum total dosage for cardiac patients. This amounts to approximately 10 carpules (20 cc.) of a solution containing 1:100,000 epinephrine.

At the present time a great many dentists are under the impression that vasoconstrictors, especially epinephrine, cannot be used in anesthetic solutions to be injected into patients who have cardiovascular disease. Often physicians advise dentists against the use of epinephrine in such patients. Although a great volume of literature concerning this problem has appeared over the past years, considerable indecision remains. It is, therefore, the purpose of this paper to present a review of the past and current literature which concerns the advisability of using local anesthetics containing epinephrine in patients with cardiovascular disease. It is hoped that this review will contribute to a resolution of this controversy.

Epinephrine is the most widely used vasoconstrictor in dental practice. Since the feeling by many authorities is either that epinephrine is the most efficient vasoconstrictor[1] or that there is not adequate evidence at present to indicate the

superiority of any one vasoconstrictor (in physiologically equivalent concentrations),[2] this paper will deal almost exclusively with epinephrine.

■ *Need for Epinephrine in Local Anesthetics*

It has doubtless been asked, "If there is any question about the safety of using epinephrine in cardiac patients, why not just play it safe and not use it?" The fallacy of this reasoning is that epinephrine is added to local anesthetic solutions to accomplish certain definite objectives. The local vasoconstriction caused by epinephrine prolongs and strengthens the effect of local anesthetics, renders the region of injection less hemorrhagic and acts to diminish the toxic effect of local anesthetics by delaying their absorption into the general circulation.[2] The last function is particularly significant in view of the fact that even though no death has been reported as being caused by the dental anesthetic use of epinephrine (discussed in detail later), numerous fatalities have occurred as a result of the toxic nature of anesthetic substances.[3-7]

■ *Epinephrine and the Circulatory System*

It would be beyond the scope of this paper to discuss the total systemic effects of epinephrine. Since the concern here is primarily with heart and blood vascular disease, the discussion will be limited to the effect of epinephrine on the circulatory system. When considering the effects of epinephrine on the human organism, it is necessary to be cognizant of the quantity of the drug used and the method of injection. The reason is that widely different effects may be obtained as these factors are varied.[8-11] For instance, a relatively large intravenous dose would cause a rise in systolic and diastolic blood pressure which would be proportional to the quantity of the drug injected. The increase in blood pressure is due to direct myocardial stimulation, increased heart rate and increased peripheral vasoconstriction in many vascular beds. In sufficient dosage the myocardial stimulation may induce arrhythmias. Diphasic hypotension also follows; that is, a dip of the blood pressure below the normal level occurs as the induced hypertensive state terminates. Smaller intravenous doses may directly cause a hypotensive state. The reason for the hypotensive reaction is debatable, but it is acceptable to consider epinephrine as having both vasoconstrictor and vasodilative properties. Smaller doses initiate the latter mechanism or, as stated by Best and Taylor,[12] the dilator response in the muscles overbalances the vasoconstriction in the skin and abdominal organs. Generally, the epinephrine constricts the blood vessels of some regions (skin and splanchnic) and dilates the vessels in other areas (heart and skeletal muscle). Whether the blood vessels in a particular region (kidney) are constricted or dilated depends on dosage.[13]

After subcutaneous injection of 0.5 to 1.0 mg. epinephrine, the heart rate is increased, the systolic pressure rises moderately, diastolic pressure falls, cardiac output and stroke volume increase. However, in small amounts (less than 0.5 mg.) administered subcutaneously, the tendency for epinephrine to increase blood pressure by cutaneous vasocon-

striction and increased cardiac output are counteracted by extensive vasodilation. The earlier work by Starr and co-workers[14] and Goldberg and co-workers,[15] as incorporated into textbooks of pharmacology, bears witness to this phenomenon. It is then logical to assume that epinephrine in dental dosage will have little or no effect on blood pressure providing the proper technics, including aspiration, are employed. Clinical illustrations of this observation will be given later.

■ *Untoward Reactions*

Mild untoward reactions that may follow the administration of epinephrine are fear, anxiety, tenseness, restlessness, throbbing headache, tremor, weakness, dizziness, pallor, respiratory difficulty and palpitation. These effects subside rapidly with rest, quiet, reassurance and recumbency.[16] They are transient and not regarded as dangerous.[17] These mild reactions occur frequently from dental dosage in the normal individual.

The more severe reactions of overdosage or inadvertent intravenous injection are of three kinds.[17] Elevated arterial pressure may result in cerebrovascular hemorrhage. Because of the peripheral constriction and cardiac stimulation, pulmonary edema from pulmonary arterial hypertension may be the second fatal toxic response to epinephrine. Ventricular hyperirritability with fatal ventricular fibrillation may occur as the third cause of death. Again the quantity of the dosage is of primary importance, but in addition, the presence of excessive doses of digitalis or the mercurial diuretics or cyclopropane anesthesia increases the chance of a fatal result.

Beckman[18] interprets the review of reported cases by Freedman[19] as indicating a minimal lethal dose (subcutaneous) of epinephrine for a normal adult to be about 4.0 mg. (4 ml. of a 1:1,000 solution) and the maximum tolerated subcutaneous dose of epinephrine to be 7.0 to 8.0 mg. Krantz and Carr[20] state that the approximate subcutaneous lethal dose for man is 10.0 mg. Subarachnoid hemorrhage and hemiplegia have been reported in young adults after a subcutaneous injection of 0.5 mg., yet there are instances in which 5.0 to 20.0 mg. injected by mistake have caused no permanent ill effects.[21,22] It is beyond the intention of this paper to discuss contraindications or safe dosages other than to consider these factors as they relate to the quantities of epinephrine used by the dentist. The use of these dosages on normal patients and those with cardiovascular disease will be discussed later on the basis of clinical studies.

■ *Dosages*

When one practitioner advises another against using epinephrine in a particular case, it is important that both know the approximate dosage of epinephrine to be used. The table shows the more common dental and medical dosages. Quantities that have been observed to cause pressor effects and those observed to cause severe reactions are illustrated for comparison.

It will be seen from the table that the dose of epinephrine routinely used for medical purposes is some 10 to 30 times greater than the amount contained in the anesthetic used for most dental procedures.

Table • Dental and medical therapeutic doses of epinephrine with data on quantities reported to cause pressor responses and severe reactions in man

	Usual concentration	Total amount
Minimum pressor effects		
Subcutaneous[23]		0.5 mg.
Intravenous infusion[24]		0.05 γ/kg./min.
Dental uses		
Most procedures	2 ml. 1:100,000	0.02 mg.
Intermediate dose	2 ml. 1:50,000	0.04 mg.
Large dose (rare)	10 ml. 1:50,000	0.2 mg.
Medical uses (subcutaneous unless otherwise indicated)		
Heart block[25]	.3– .6 ml. 1:1,000 (repeated)	0.3–0.6 mg.
Acute cardiac failure[25]	.2– .5 ml. 1:1,000	0.2–0.5 mg.
Cardiac asthma[25]	.2– .3 ml. 1:1,000	0.2–0.3 mg.
Bronchial asthma[25]	.2– .5 ml. 1:1,000 (repeated)	0.2–0.5 mg.
in oil[25]	.2–1.5 ml. 1:500 (IM)	0.4–3.0 mg.
Obstetrics[26]	.3 ml. 1:1,000	0.3 mg.
Spinal anesthesia[26]	(intraspinal)	1.0 mg.
Uticaria, angioneurotic edema[27]	.6–1 ml. 1:1,000	0.6–1.0 mg.
Serum sickness[27]	.6–1 ml. 1:1,000	0.6–1.0 mg.
Hypoglycemia[27]	.5–1 ml. 1:1,000	0.5–1.0 mg.
Cardiac arrest[25]	.2–.5 ml. 1:1,000 (myocardium)	0.2–0.5 mg.
Severe reactions		
Minimum lethal dose (subcutaneous—normal adult)[18]		4.0 mg.
Maximum tolerated[18]		7.0–8.0 mg.
Lethal dose[30]		10.0 mg.

■ *Physiologic Absorption of Epinephrine*

Epinephrine is not absorbed in pharmacologically active amounts from the enteric mucosa. This results from its destruction in the gastrointestinal tract and conjugation and oxidation in the liver. The rate of absorption in subcutaneous tissue is related to the vascularity of the region and may be hastened by massage. The intramuscular injection provides absorption that is almost as rapid as the intravenous injection because of the dilatory effect produced on the blood vessels of skeletal muscle. The effects of absorption through inhalation are limited largely to the respiratory tract.

■ *Metabolic Fate of Epinephrine*

In 1940, Richter[28] stated that, "Experiments in vitro have shown that adrenalin is readily oxidized by a number of different enzyme systems." He lists: (1) catechol oxidase, (2) the cytochrome system, (3) amine oxidase, (4) peroxidase and (5) pseudophenolases as the involved enzyme systems. But he also stated that it is not known to what extent any of these systems are concerned in the inactivation of epinephrine in vivo.

Now, 19 years later, the in vivo fate of epinephrine is understood more completely. The most salient points concerned follow.

1. Epinephrine is rapidly inactivated in the body, but, because of the presence of protective proteins and reducing agents, it is somewhat stable in blood. Although most tissues can inactivate epinephrine, the liver seems to be the most important site of metabolism. Inactivation is increased by hyperthermia[29]

and decreased by ephedrine and cocaine.[30]

2. Negligible amounts of epinephrine appear normally in the urine. Ligation of the renal vessels does not prolong the action of epinephrine.[31]

3. The previously popular theory of the in vivo inactivation of epinephrine by oxidative deamination via the amine oxidase system has been questioned during the last few years, specifically by von Euler and Zetterstrom.[32] Present evidence supports the view that this system may contribute only to a minor extent in the inactivation of epinephrine in vivo.[33-35]

4. Recent work indicates that the principal pathway for the metabolism of epinephrine in man is O-methylation to metanephrine.[33,35] This physiologically inactive metabolite (metanephrine) is then conjugated or deaminated and oxidized to 3-methoxy-4-hydroxymandelic acid which is eliminated in the urine.[36,37]

■ *The Problem*

The controversy over the use of epinephrine in patients suffering from cardiovascular disease arises mainly from three sources. The first is the failure of the practitioner to take into account the factor of quantity when he considers the organic reaction to epinephrine. For instance, to consider the severe reactions to epinephrine as previously mentioned without realizing that the quantities of epinephrine concerned are many times those used in dentistry would give an unrealistic view of the problem.

Secondly, it is not necessary to become frightened over reactions shown to occur in laboratory animals if clinical studies with clinical dosage do not illustrate that the phenomenon is of significance in man. For instance, some would feel that an unfavorable light had been shed on the use of epinephrine with procaine in view of the well known fact that procaine and some other anesthetics potentiate the action of epinephrine. Wiedling[38] showed this with rabbits, and he refers to the work of Haggart and Woods[39] (dogs), Nakauchi and Karczmar[40] (dogs), and many others as supporting this work. However, it must be realized that although this potentiating effect is of great academic interest, it has not been shown to be of clinical significance in dental practice. It is impossible to accept clinically, pound for pound, the data acquired through experiments on laboratory animals.

The third, and possibly most important, reason for the confusion over the use of epinephrine in patients with cardiovascular disease is the presence in the literature of profoundly stated opinions without experimental or clinical evidence to support the statements. In 1934 dentists could have read, "Aortic regurgitation, mitral insufficiency, exophthalmic goiter, arteriosclerosis and hypertension indicate the use of novocaine without epinephrine content."[41]

In 1932 a writer[42] advised against the use of local anesthetics with epinephrine on hypertensive patients. A similar attitude was expressed in 1939:

> It would be good judgment to ask every patient more than forty-five years of age whether or not he has high blood pressure, kidney disturbance or anything like heart attacks, before adrenalin-like substances are administered. It is known that these drugs may precipitate a heart attack.[43]

In 1946 an article stated, "Cardiac

complications, such as precordial pain or coronary thrombosis, when they occur, are caused by vasoconstrictors in the solution and are apt to be serious."[44] In a 1948 issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, the statement was made that the reduction or elimination of vasoconstrictor agents in local anesthetics is desirable. "These agents are dangerous, particularly for patients with anginal pain or hypertension."[45]

A book on coronary artery disease published in 1949 states that the beneficial increase in coronary blood flow after epinephrine injection is overshadowed by the increase in the vigor of contraction and by the elevated metabolism of the heart, the greater work requiring a greater blood supply. The text further states that if the coronary arteries are sclerotic, the increase may not be forthcoming so that the epinephrine may induce anginal attacks.[46] The preceding statements have one thing in common besides the condemnation of epinephrine. They present no experimental or clinical evidence to support their views. The last statement relative to anginal attacks obviously concerns the use of epinephrine in greater quantities than ordinarily employed for dental procedures.

As late as 1949, an editor of a periodical said, "Reference is made to the treatment of those patients in whom epinephrine is contraindicated, such as cardiacs, arteriosclerotics, anemics, etc."[47] The mention of anemia is particularly misleading and is an excellent example of the statements without foundation which have created the present indecision concerning the use of epinephrine with local anesthetics. Death due to local anesthesia does occur, and the poor risk patient is naturally of primary concern. However, investigation indicates that epinephrine is not the source of these deaths.

In 1958 the *British Medical Journal*[48] reported a death due to epinephrine injection. When the report is examined it will be seen that death was caused by the mistaken injection of 2 cc. (subcutaneous) of a nasal spray containing 4.5 mg. epinephrine per cubic centimeter and was not the result of a therapeutic dose.

■ *Clinical Studies*

In the past few years an overwhelming volume of literature (based on clinical observations) has appeared in rebuttal of the statements previously quoted. A review of the pertinent studies in the problem follows.

Presenting further proof that the systemic effects of procaine solutions with and without epinephrine have slight or clinically insignificant differences in arterial blood pressure and pulse rate, Wallace and co-workers[49] carried out a controlled investigation on a blind basis (56 experiments on 19 normal dental students). They found no clinically significant difference in systemic effect between 2 cc. doses of 2.0 per cent procaine hydrochloride solutions with and without epinephrine. Tracings from the finger plethysmograph, pneumograph, electroencephalograph and electrocardiograph and data on blood pressure were used as criteria.

Tainter and Winter[50] analyzed the results of a "blind test" study of 13 local anesthetic solutions used for oral surgical

procedures in almost 4,000 patients (2,682 normal patients, and 485 with heart or circulatory disease, the remainder had other diseased conditions or were pregnant). They found that,

> . . . inspection of the average blood pressure levels after the injection of the anesthetic reveals that all of the various groups responded with an increase in blood pressure, both systolic and diastolic, of about the same magnitudes, the exception being pregnancy, where there were few patients recorded, and where changes were minimal.

Injected epinephrine is to some degree localized in the tissues and the quantity of epinephrine injected may produce less blood concentration than that produced by the patient's own adrenal medulla;[51] therefore, Follmar and coworkers[52] set out to compare the blood pressure responses to representative local anesthetics and vasoconstrictors. They found that in studies in which 200 patients were given placebos, 200 were given 2.0 per cent procaine plus 1:50,000 epinephrine and 50 were given 2.0 per cent Xylocaine plus 1:50,000 epinephrine, a decrease in diastolic pressure was seen five minutes after injection and this was the only statistically significant change; no elevation of blood pressure occurred. Fifty injections with l-arterenol 1:30,000, 0.4 per cent Ravocaine and 2.0 per cent procaine gave similar results. They further state that the data collected on preinjection and postinjection blood pressure studies clearly indicate that the endogenous epinephrine secreted by the adrenal glands of the apprehensive patient is much more of a hypertensory threat than is the exogenous vasoconstrictor of an anesthetic solution. This emphasizes the importance of adding a vasoconstrictor to insure an adequate anesthesia, lest the pain of the procedure prompt the secretion of far more autogenous epinephrine than the dental practitioner would ever inject.

Dick,[53] in speaking of inadequate anesthesia caused by the failure to use epinephrine, says that fright plus an increase in the patient's apprehension, associated with the usual reflex stimulation from pain, frequently results in his secreting much more epinephrine from his own adrenal glands than would have been used in the anesthetic solution had it contained epinephrine. Dick feels that it would be wiser and less hazardous to avoid the secretion of this autogenous epinephrine in the blood stream by the careful use of satisfactory anesthesia in the first place.

To test the belief that small amounts of epinephrine produce only relaxing effects in contrast to the characteristic elevated blood pressure, increased heart rate and increase in cardiac output resulting from large doses of epinephrine, McCarthy[54] compared the blood pressure responses of patients to 4.0 per cent procaine, 4.0 per cent procaine plus 1:50,000 epinephrine, 2.0 per cent Xylocaine, 2.0 per cent Xylocaine plus 1:100,000 epinephrine, isotonic saline and pseudoinjection (the needle is placed in the mouth but does not enter the tissues). In 240 experiments he observed a psychosomatic hemodynamic pressor and heart rate response caused by fear of the injection, thus demonstrating the need for routine premedication of patients with cardiovascular disease. It was further demonstrated that small amounts of epinephrine

caused a slight hemodynamic depressor effect, not the cardiovascular stimulation feared, in patients with heart and circulatory diseases.

In a study involving 45 control subjects plus 450 cardiovascular patients, Salman and Schwartz,[55] using various anesthetics and vasoconstrictors, found that the greatest rise in systolic and diastolic blood pressure during and immediately after injection in the cardiac disease group occurred earlier than in the control group and was somewhat higher. This rise was obviously due to the increased fear reaction since the injected solution would not have had time to produce a systemic effect. In most patients (normal and cardiovascular) it was found that the systolic and diastolic blood pressure decreased after five minutes. No untoward effects were observed other than some instances of pallor and trepidation which probably were caused by a psychic reaction or a systemic reaction to the anesthetic drug. Such reactions are observed in normal patients as well as those with heart disease.

Oringer[56] states,

> . . . when vasoconstrictor-free procaine solution and to a somewhat lesser degree, the procaine-neosynephrine solution were administered, particularly with hypertensive patients, the resultant anesthesia was so transitory in nature that few operations of even brief duration were completed painlessly.

This is particularly significant in the light of Coakley's statement[57] that, "Inadequate anesthesia is frequently traumatic and is not the answer in the management of the poor surgical risk." Coakley feels that when insufficiently potent drugs or too light anesthesia are used, the resulting anesthesia is sometimes inadequate, thus necessitating supplementary anesthesia under circumstances that frequently are adverse. Along the same line, Costich[58] compared procaine with procaine plus 1:50,000 epinephrine (250 experiments). He concludes that 2.0 per cent procaine without epinephrine, when given as an inferior alveolar nerve block, fails to produce anesthesia of sufficient depth or duration to warrant its routine use. The procaine-epinephrine solution showed a drop in post-injection diastolic pressure (5 mm. Hg), longer duration of anesthesia, increased occurrence of tremor, sweating and faintness and a more desirable depth of anesthesia. No significant difference was observed in pulse rate, systolic blood pressure, pulse pressure or respiration.

The statement by Tainter[59] that, ". . . the actual threat to life or to serious consequences from the reaction is much less when this agent (a vasoconstrictor) is present," takes on added significance in view of the previously presented experimental evidence that cardiac patients react more severely to stress (fear, pain and apprehension) than normal patients and that the failure to use epinephrine reduces the likelihood of obtaining adequate anesthesia.

Mead[60] cites the work of Tainter and co-workers[61] and states, ". . . recent opinions and accumulated clinical experience indicate that, if used with proper caution and adequate preoperative preparation, epinephrine-containing anesthetic solutions are actually safer than those not containing a vasoconstrictor." He considers those physicians and dentists who oppose the use of epinephrine in patients

with heart disease to be unrealistic and states:

> . . . oral operations under local anesthesia without adequate vasoconstrictors are often associated with pain. Anxiety, apprehension and pain typically produce far more adrenalin by causing spontaneous natural secretion than does the injection of a moderate amount of a local anesthetic agent with 1:50,000 or 1:100,000 epinephrine.

Dick reviewed all available sources of information of the past 30 years and was unable to find a single death reported that was attributed to epinephrine as used in dental anesthesia. At the time of Dick's evaluation (1953), over 30,000,000 injections of local anesthetics were being given per year by dentists. "Obviously, knowingly and unwittingly thousands of patients with severe hypertension, angina pectoris and previous cardiac occlusion have been injected with these solutions containing epinephrine."[53] Dick further attributes what he calls the misguided warnings about epinephrine given to dentists by physicians to the fact that the medical doctors think of epinephrine in terms of 1:1,000 solution in amounts of .5 to 1.0 cc. (0.5 to 1.0 mg.). This is several times the concentration used in dentistry. Two cubic centimeters of a 1:50,000 epinephrine solution (most dental procedures can be done with 2 cc.) contain 0.04 mg. epinephrine. This is only 8.0 per cent of the effective dose (subcutaneous) of epinephrine required to produce a positive pressor effect in man, as previously quoted from White and co-workers. This substantiates the experimental data reviewed earlier.

The New York Heart Association[62] states that 0.2 mg. of epinephrine in any form is the maximum limit for cardiac patients. The International Heart Associations[63] agree on this limit which is five times as great as the amount contained in 2 cc. of 1:50,000 epinephrine. In the report of the New York Heart Association in which the previous 0.2 mg. limit was promulgated, the Association indicates a concern for the emotional stress to which the heart patient may be subjected rather than a concern for the epinephrine used. They advise the following:

> The dentist should have information from the physician about the nature and severity of the heart disease in the patient. He should also have knowledge of medication the patient is receiving, particularly such medication as might increase the activity of the epinephrine. This knowledge is important because ordinary dental procedures may produce emotional stress and cause cardiac disturbances which might be wrongly attributed to epinephrine. Under these conditions and with these precautions, the use of epinephrine with procaine for dental surgery presents no special hazards in persons with heart disease.

From a study in which office procedure was simulated, Cheraskin and Prasertsuntarasai[64] studied the blood and pulse pressure responses of 136 subjects (70 normotensive and 66 hypertensive). Upon examination of the patients (sitting) after arrival at the clinic for surgery, they found 18.4 mm. mercury increase over basal systolic pressure for normotensive patients and 19.9 mm. mercury increase over basal pressure for hypertensive patients. Discounting the increase caused by the physical activity in reaching the clinic (up 13.1 for normotensive and up 11.8 for hypertensive individuals), an increased systolic pressure due to the anxiety related to the imminent operation

was evident. Taking into account the factor of physical activity in reaching the clinic, they found an increase in diastolic pressure (much less than systolic), mean pressure and pulse pressure. The increased pulse rate was determined to be almost entirely due to the physical activity in reaching the clinic.

In a second part of the study[65] the afore-mentioned authors determined that patients show a distinct rise in blood pressure while seated in the waiting room anticipating dental surgery. Since a significant reduction in systolic, mean and pulse pressure levels was observed only in those hypertensive subjects to whom a central nervous system depressant had been administered, the authors conclude that the cause of the increased blood pressure is anxiety. In a third part of the study,[66] Cheraskin and Prasertsuntarasai found that in practically all instances only small and statistically insignificant variations in blood pressure and pulse rate occurred two minutes after the patient was seated in the dental chair (preinjection). They also found no significant change in blood pressure and pulse rate 5 and 10 minutes after injection of a local anesthetic with and without epinephrine in sedated and nonsedated normotensive and hypertensive patients. In the fourth part of the study[67] they observed that significant blood pressure changes occurred at the start and end of tooth extraction. They found a statistically significant rise in systolic, mean and pulse pressure at the start of the extraction in nonsedated hypertensive patients who did not receive epinephrine. There was also a statistically significant increase in systolic pressure at the start of tooth extraction in sedated normotensive subjects who had not received epinephrine. They also observed a statistically significant decrease in systolic, mean and pulse pressure at the end of the extraction only in those sedated hypertensive patients who received epinephrine with the local anesthetic. Summarizing their studies, Cheraskin and Prasertsuntarasai stated that the sedated hypertensive subjects given epinephrine seemed to have fared better than those who did not receive sedation and a vasoconstrictor. They feel that a possible explanation is the fact that local anesthesia without a vasoconstrictor is often poor anesthesia. "Since the dental extraction will more likely produce pain, there is the risk of endogenous epinephrine in amounts greater than those introduced with the local anesthetic solution."[67]

■ *Summary*

Although no fatalities resulting from the use of epinephrine in local anesthetics have been reported, deaths do occur from reactions to anesthetic agents. One of the important functions of epinephrine in local anesthetic solutions is to localize the anesthetic agent, thus preventing systemic effects.

2. When reading the literature concerning the effect of epinephrine, the reader should be cognizant of the quantities involved, the method of injection and the experimental and clinical basis for the opinions expressed.

3. There is considerable disparity between dental and medical dosages of epinephrine.

4. Clinical studies have indicated that the epinephrine in anesthetic solutions is not responsible for significant

systemic effects. Conversely, there is evidence to support the view that the inadequate depth of anesthesia obtained when epinephrine is not used results in an increase in pain, fear, apprehension and an increased release of endogenous epinephrine. These undesirable features, plus the hastened release of the anesthetic substance into the systemic circulation, support the contention that anesthetics containing epinephrine are actually safer than those not containing epinephrine provided the proper technics, including aspiration, are employed. The evidence indicates that although the patient with cardiovascular disease reacts more unfavorably to pain, fear and apprehension than the normal patient, there is no clinically significant difference in the systemic effects of anesthetic solutions containing epinephrine in normal patients and in those with cardiovascular disease. In other words, the increased blood pressure and heart rate associated with dental procedures are primarily due to fear and apprehension, are more severe in patients with cardiovascular disease, and are not augmented by the injection of an anesthetic solution containing epinephrine.

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1. Monheim, L. M. Local anesthesia and pain control in dental practice. St. Louis, C. V. Mosby Co., 1957, p. 200.

2. Archer, W. H. A manual of dental anesthesia, ed. 2. Philadelphia, W. B. Saunders Co., 1958, p. 53.

3. Adriani, John, and Campbell, D. Fatalities following topical application of local anesthetics to mucous membranes. J.A.M.A. 162:1527 Dec. 22, 1956.

4. Case report. (Death following local anesthesia.) Modern Den. 25:4 Jan. 1958.

5. Criep, L. H., and Ribeiro, C. de C. Allergy to procaine hydrochloride with three fatalities. J.A.M.A. 151:1185 April 4, 1953.

6. Seldin, H. M. Survey of anesthetic fatalities in oral surgery and a review of the etiological factors in anesthetic deaths. J. Am. D. Soc. Anesthes. 5:6 Feb. 1958.

7. Waters, R. M., and Gillespie, N. A. Deaths in operating rooms. Anesthesiology 5:113 March 1944.

8. Beckman, Harry. Drugs, their nature, action and use. Philadelphia, W. B. Saunders Co., 1958, p. 347-349.

9. Drill, V. A. Pharmacology in medicine, ed. 2. New York, McGraw-Hill, 1958, p. 380-384.

10. Goodman, L. S., and Gilman, Alfred. The pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 485-487.

11. Grollman, Arthur. Pharmacology and therapeutics, ed. 3. Philadelphia, Lea & Febiger, 1958, p. 254-258.

12. Best, C. H., and Taylor, N. B. The physiological basis of medical practice, ed. 5. Baltimore, Williams & Wilkins Co., 1950, p. 797.

13. Bearn, A. G.; Billing, B., and Sherloch, S. The effect of adrenalin and noradrenalin on hepatic blood flow and splanchnic carbohydrate metabolism in man. J. Physiol. 115:430 December 28, 1951.

14. Starr, Isaac, and others. A clinical study of the action of 10 commonly used drugs on cardiac output, work and size; on respiration, on metabolic rate and on the electrocardiogram. J. Clin. Investigation 16:799 September 1937.

15. Goldenberg, M., and others. The hemodynamic response of man to nor-epinephrine and epinephrine and its relation to the problem of hypertension. Am. J. Med. 5:792 Dec. 1948.

16. Goodman, L. S., and Gilman, Alfred. The pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 494.

17. Drill, V. A. Pharmacology in medicine, ed. 2. New York, McGraw-Hill, 1958, p. 388-389.

18. Beckman, Harry. Drugs, their nature, action and use. Philadelphia, W. B. Saunders Co., 1958, p. 352.

19. Freedman, B. J. Accidental adrenaline overdosage and its treatment with piperoxan. Lancet 2:575 Sept. 17, 1955.

20. Krantz, J. C., and Carr, C. J. The pharmacologic principles of medical practice, ed. 4. Baltimore, Williams & Wilkins Co., 1958, p. 751.

21. Goodman, L. S., and Gilman, Alfred. The pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 494.

22. Horwitz, Orville. A case of large overdoses of epinephrine. Am. Heart J. 33:107 January 1947.

23. White, J. C.: Smithwick, R. H., and Simeone, F. A. The autonomic nervous system, ed. 3. New York, Macmillan Co., 1952, p. 98.

24. Munch, J. C. A note on pressor drugs. VI. Acute toxicity of epinephrine. J. Am. Pharm. A. (Scient. ed.) 45:431 June 1956.

25. Goodman, L. S., and Gilman, Alfred. The pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 494-497.

26. Drill, V. A. Pharmacology in medicine, ed. 2. New York, McGraw-Hill, 1958, p. 389-390.

27. Grollman, Arthur. Pharmacology and therapeutics, ed. 3. Philadelphia, Lea & Febiger, 1958, p. 262-263.

28. Richter, Derek. The inactivation of adrenalin in vivo in man. J. Physiol. 98:361 July 24, 1940.

29. Fuhrman, P. A., and others. The effect of temperature on the inactivation of epinephrine in vivo and in vitro. J. Pharmacol. & Exper. Therap. 80:323 April 1944.

30. Torda, C. Effect of cocaine on the inactivation of epinephrine and sympathin. J. Pharmacol. & Exper. Therap. 78:331 August 1943.

31. Goodman, L. S., and Gilman, Alfred. The pharmacological basis of therapeutics, ed. 2. New York, Macmillan Co., 1955, p. 492.

32. von Euler, U. S., and Zetterstrom, B. The role of amine oxidase in the inactivation of catechol amines injected in man. Acta Physiologica Scandinavica 33/Suppl. 118:26, 1955.

33. Axelrod, Julius. The metabolism of catechol amines in vivo and in vitro. Pharmacol. Rev. 11 (No. 2, Part 2): 402 June 1959.

34. Corne, S. J., and Graham, J. D. The effect of inhibition of amine oxidase in vivo on administered adrenalin, noradrenalin, tyramine, and serotonin. J. Physiol. 135:339 Feb. 1957.

35. LaBrosse, E. H.; Axelrod, Julius, and Kety, S. S. O-methylation, the principal route of metabolism of epinephrine in man. Science 128:593 Sept. 1958.

36. Armstrong, M. D.; McMillan, A., and Shaw, K. N. F. 3-methoxy-4-hydroxymandelic acid, a urinary metabolite of norepinephrine. Biochim. Biophys. Acta 25:422 Aug. 1957.

37. Goodall, McC. Metabolic products of adrenalin and noradrenalin in human urine. Pharmacol. Rev. 11 (No. 2, Part 2): 416 June 1959.

38. Wiedling, Sten. The effect on blood pressure of local anesthetics in combination with vasoconstrictors on blood pressure. J. Ontario D. A. 31:237 Aug. 1954.

39. Haggart, J., and Woods, L. A. Mechanism of the depressor action of procaine, lidocaine and cocaine in etherized dogs. (Abst.) J. Pharmacol. & Exper. Therap. 103:345 Dec. 1951.

40. Nakauchi, Mark, and Karczmar, A. G. Hemodynamic effects of lidocaine solutions. (Abst.) Fed. Proc. 11:378 March 1952.

41. Bloom, D. D. A consideration of procaine anesthesia for dental purposes. D. Cosmos 76:1094 Oct. 1934.

42. Hansen, O. S. Common sense about heart disease. D. Digest 38:220 June 1932.

43. Lundy, C. J. What the dentist should know about angina pectoris, coronary thrombosis and arteriosclerosis. D. Digest 45:104 March 1939.

44. Hickey, M. J. Local anesthesia in oral surgery. J.A.D.A. 33:1532 Dec. 1946.

45. Carr, M. W. Heart disease: prophylactic and therapeutic management of the patient in dental practice. J.A.D.A. 36:253 March 1948.

46. Boas, E. P., and Boas, N. F. Coronary artery disease. Chicago, Year Book Pub., Inc., 1949, p. 86-87.

47. Nevin, Mendel. Neosupranol, a new vasoconstrictor without the side effects of epinephrine. Modern Den. 16:3 Oct. 1949.

48. Death after adrenalin injection. Brit. M. J. No. 5072: 716 March 22, 1958.

49. Wallace, D. A., and others. Systemic effects of dental local anesthetic solutions. Oral Surg., Oral Med. and Oral Path. 9:1297 Dec. 1956.

50. Tainter, M. L., and Winter, L. Some general considerations in evaluating local anesthetic solutions in patients. Anesthesiology 5:470 Sept. 1944.

51. Best, C. H., and Taylor, N. B. The physiological basis of medical practice, ed. 5. Baltimore, Williams & Wilkins Co., 1950, p. 801.

52. Follmar, K. E., and others. The effects upon human blood pressure of representative local anesthetics and vasoconstrictors. Northwestern U. Bul. 54:13 March 1954.

53. Dick, S. P. Clinical toxicity of epinephrine anesthesia. Oral Surg., Oral Med. & Oral Path. 6:724 June 1953.

54. McCarthy, F. M. Clinical study of blood pressure responses to epinephrine-containing local anesthetic solutions. J. D. Res. 36:132 Feb. 1957.

55. Salman, I., and Schwartz, S. P. Effects of vasoconstrictors used in local anesthetics in patients with diseases of the heart. J. Oral Surg. 13:209 July 1955.

56. Oringer, M. J. The roles of minimum dosage and vasoconstriction in safety and efficiency of local anesthesia: physiologic effects and technique of administration. Oral Surg., Oral Med. & Oral Path. 2:1566 Dec. 1949.

57. Coakley, C. S. Anesthesia for the patient with cardiovascular disease for ambulatory oral surgery. Am. D. Soc. Anesthes. Newsmonthly 4:5 Feb. 1957.

58. Costich, E. P. Study of inferior alveolar nerve block anesthesia in humans, comparing 2 per cent procaine with 2 per cent procaine plus 1:50,000 epinephrine. J. D. Res. 35:696 Oct. 1956.

59. Tainter, M. L. Reactions to local anesthetics. J. South. California D. A. 7:118 April 1940.

60. Mead, S. V. Use of epinephrine-containing anesthetic solutions in oral surgery. J. Oral Surg. 14:79 Jan. 1956.

61. Tainter, M. L.; Throndson, A. H., and Moose, S. M. Vasoconstrictors on the clinical effectiveness and toxicity of procaine anesthetic solutions. J.A.D.A. & D. Cosmos 25:1321 Aug. 1938.

62. Special Committee of the New York Heart Association, Inc. Use of epinephrine in connection with procaine in dental procedures. J.A.D.A. 50:108 Jan. 1955.

63. Queguiner, A. Possible contraindication to the use of epinephrine in dental practice. D. Abs. 3:473 Aug. 1958.

64. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. I. Blood pressure and pulse rate observations in the waiting room. J.A.D.A. 55:761 Dec. 1957.

65. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. II. Effect of sedation on blood pressure and pulse pressure and pulse rate in the waiting room. J.A.D.A. 56:210 Feb. 1958.

66. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. III. Effect of epinephrine on blood pressure and pulse rate. J.A.D.A. 57:507 Oct. 1958.

67. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. IV. Effect of tooth extraction on blood pressure and pulse rate. J.A.D.A. 58:61 Jan. 1959.

■ Renewal of Cells

Mitotic figures are often present in adult tissues. Undoubtedly, some of this mitotic activity accounts for the slight tissue growth which exists in the adult phase of life. However, in a number of locations, the frequency of mitosis greatly exceeds that required for growth. Some of the areas of proliferation are easily accounted for. . . . In other cases, however, the tissue in which mitosis takes place shows no change in the number or size of its component structure; and, therefore, the cell production must be balanced by a cell loss. In such an instance, the cells of the tissue are said to undergo "renewal." *C. P. Leblond and B. E. Walker, Renewal of Cell Population, Physiological Reviews, April 1956.*

Laboratory facilities available to the general practitioner

■ *Willson J. Fahlberg,* Ph.D., Houston, Texas*

Hospital and private diagnostic laboratories are very helpful in assisting the dentist to solve problems related to pathologic microbiology of the oral cavity.

With intelligent interpretation of bacterial sensitivity tests, the proper antibiotic can be selected and utilized with confidence that it is the indicated agent to combat the infection that is present.

In many communities the hospital laboratories are happy to have the practicing dentist submit specimens to them for diagnostic procedures. The individual need not be a member of the staff and the arrangements can be made quickly through the laboratory director. Similarly there are many private diagnostic laboratories which would welcome specimens.

■ *Oral Diseases and Methods of Specimen Collection*

The common oral diseases, the method of specimen collection and, briefly, their laboratory diagnosis, are as follows:

1. Vincent's infection. Clinically Vincent's infection is readily recognized by the dentist; however, occasionally it may be desirable to confirm the clinical impression. This is done by examining a stained smear of scrapings from the lesion under the oil immersion lens of a microscope. The inner aspects of the ulcerated region may be scraped with a sterile probe and the material spread on a glass slide. The slide should be allowed to dry in the air, passed through a flame briefly, and sent to the laboratory. Technicians will stain with methylene blue or crystal violet and examine microscopically for the presence of large numbers of spirochetes, fusiform bacilli and polymorphonuclear leukocytes. The dentist should have a confirmed diagnosis within 24 hours.

2. Oral candidiasis. As in the case of Vincent's infection, oral candidiasis usually is readily diagnosed by its clinical appearance. This disease may be primary or follow antibiotic therapy. Since the advent of broad spectrum antibiotics there has been a considerable increase in secondary condidiasis resulting at least in part from the suppression of the normal flora of the mouth and gastrointestinal tract. Smears are taken and handled in the fashion previously described for Vincent's infection and the microscopic examination shows large sheets of budding yeast cells pathognomonic of candidiasis. Under certain conditions it may be desirable to culture this organism. This may be done readily by rolling a sterile dry swab across the lesion and placing in a

tube of thioglycollate broth obtained from Difco or BBL laboratories. This specimen, when forwarded to the laboratory, will require three to four days for diagnosis because of the slowness with which characteristic chlamydospores appear.

3. Herpetic lesions. Herpetic lesions, when they occur as punched out lesions on the tongue and buccal mucosa, frequently resemble the lesions of Vincent's infection sufficiently to render a clinical diagnosis difficult or impossible. However, smears collected and stained by a similar method to the one outlined for Vincent's infection fail to reveal the microscopic features of smears taken in instances of Vincent's infection.

4. Stomatitis of the type following pneumonia or an upper respiratory infection frequently are caused by either *Staphylococci* or *Streptococci*. There is some evidence that the staphylococci may emerge as a result of previous antibiotic therapy administered for the upper respiratory infection. It is perhaps in stomatitis that the diagnostic laboratory is of the greatest value from both the standpoint of diagnosis and therapy. It is advisable that both smears and cultures be taken aseptically in thioglycollate broth and submitted to the laboratory. The smears will give a clue as to the predominance of the staphylococci or streptococci and the cultures as to their identification as pathogenic microorganisms. Antibiotic sensitivity tests will determine the drug of choice for therapy. The diagnostic laboratory usually requires two to three days to complete these tests.

5. Cervicofacial disease. As a general rule the practicing dentist has no great difficulty in recognizing cervicofacial disease clinically when it is caused by *Actinomycetes* or *Nocardia*, because of its chronicity, the appearance of sinus tracts, granules in a serous exudate, and so on. On occasion these tracts become secondarily infected by staphylococci or streptococci and the primary cause of the disease is obscured by a frank purulent exudate. Thus it is desirous to consult the diagnostic laboratory. Swabs taken aseptically and placed in thioglycollate broth as well as smears of the exudate should be forwarded to the laboratory. The secondarily infecting organisms usually can be identified and their antibiotic spectrum determined within 72 hours. The actinomycetes and nocardia may require as long as 10 to 14 days to diagnose because of their slower rate of growth.

6. Miscellaneous oral ulcers such as those caused by the spirochete of syphilis or the tuberculosis bacillus today are observed with relative infrequency in the United States. Clinical diagnosis may be suggested by the patient's history and confirmed by serological, histological or cultural procedures, depending on the cause of the lesion.

7. Routine root canal cultures to determine the absence of organisms prior to filling the canal, although suggested by many dental schools, are not utilized in practice because of lack of availability of necessary materials. Currently it is possible for the dentist to use paper points and to drop them into thioglycollate broth obtainable from either the diagnostic laboratory or one of the biological houses. These tubes are then incubated for four days in the diagnostic laboratory and the results reported to the dentist.

■ *Antibiotic Sensitivities*

In the era of chemotherapeutic and antibiotic medicine it has become important that the dentist know what is the drug of choice in the case of an oral infectious disease. The advent of penicillin tooth paste, the indiscriminate use of broad spectrum antibiotics by physicians, and so on, have led to the emergence of strains of certain bacteria notably resistant to the commonly employed antibiotics. Thus, it is neither feasible nor possible to take cultures in all instances of oral infections, certainly, in infections which do not respond promptly to the usual course of antibiotics, cultures should be examined in the laboratory and the selection of the most effective inhibiting agent should be based on the laboratory results.

Methods of antibiotic sensitivity determinations are available in the routine laboratory. The two procedures currently available in this country are: (1) the disk of paper impregnated with antibiotics and (2) the test tube dilution method. For the examination using the first method, the test organism is streaked on a suitable agar medium and the disks containing antibiotics, supplied by various biological laboratories, are placed on top of the agar. During incubation the antibiotics diffuse through the agar, inhibiting the organisms' growth if the bacteria are sensitive. In the test tube dilution method, the antibiotic is serially diluted in broth, which is subsequently inoculated with the test organism, incubated and the lowest level of antibiotic that inhibits growth is reported.

The paper disk procedure has certain inherent errors as the various antibiotics have different diffusion constants depending on their water solubilities, the depth of agar, temperature of incubation, and so on, which give different zones of inhibition. Thus the antibiotic exhibiting the greatest zone of inhibition in vitro may not be the most effective in vivo but simply have a greater diffusion constant. However, this procedure is simple, rapid and cheap and is the most common one employed. It will give a general idea as to the sensitivity or resistance of a microorganism. On the other hand, the test tube reaction is considerably more accurate but is laborious and time consuming and is generally employed only under certain special circumstances.

Throughout the past few years there has been a growing awareness on the part of the general medical and dental practitioners that too often with antibiotics they administer too little too late, or too much too long. The single shot therapy for staphylococcal and streptococcal infections is an example of giving too little too late. In secondary candidiasis, the reverse is true; this is generally the result of broad spectrum antibiotics being administered too long.

■ *Comment*

The fact should be emphasized that the laboratory can and does offer certain advantages to the general dental practitioner. The results from the laboratory must be interpreted, keeping the points that have been discussed in mind. Although the so-called resistant or drug-fast strains of bacteria are here to stay, the dentist can help control their numbers by avoiding the abuse of antibiotics.

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CASE REPORTS

Hypertrophy of buccal mucosa resulting from use of intermaxillary elastics in fracture therapy: *report of case*

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The complications that may arise during the treatment of mandibular fractures are many and varied. The irritating effects of the appliances are seen in both the hard and soft structures of the oral cavity. In the case herein described, there was an unusual soft tissue response to the mechanical irritation of an intermaxillary appliance. A method is presented by which this pathologic condition may be treated or prevented.

Many methods have been utilized to immobilize a fracture after it has been reduced and fixed. The use of intermaxillary elastics has become the accepted procedure because elastics have certain advantages over direct wiring. The continuous pull of the elastics, the slight stimulating movement allowed, the ability to reduce a distracted fragment gradually and the ease of removal in emergencies are all distinct advantages. In the case to be discussed the standard type of intermaxillary elastics was used and the patient developed severe mucosal hypertrophy of the buccal tissue that was in contact with the elastic bands. The elastic band that is used most frequently is a loop type that is stretched between the jaws and held by any of the numerous appliances designed for that purpose. It may be cut from soft rubber tubing or purchased as orthodontic rubber bands. A new method of elastic fixation was used in this instance to eliminate the irritating qualities of the elastic bands normally used. Certain conditions have been set forth as qualifications for adequate intermaxillary appliances.

1. The apparatus must hold the fragments immobile and in proper alignment.

2. It must be sufficiently strong and well anchored in position to withstand the stress placed upon it.

3. It should cause minimum injury to the soft tissue.

4. The teeth should be held snugly in proper occlusion and they must not be injured.

5. The apparatus should be one which can be made, applied and worn with a minimum of discomfort to the patient.[1]

The method of intermaxillary elastic fixation to be described does fulfill the foregoing requirements and may be used when abnormal tissue hypertrophy results from the use of the regular rubber band type of elastic fixation.

REPORT OF CASE—A 27 year old white, slender man was admitted to San Francisco General Hospital on June 25, 1959, with a diagnosis of a compound fracture through the body of the right side of the mandible. A second fracture was located to the left of the

symphysis and also compounded into the oral cavity. The patient had been in an altercation and received a blow with a fist.

CLINICAL EXAMINATION — A compound fracture of the body and symphysis was seen with false movement of the fragments evident. There was slight swelling over the body of the mandible on the right side and no facial lacerations. Intraoral examination revealed poor oral hygiene and teeth in poor repair. The following teeth were missing: in the upper jaw, both lateral incisors, both cuspids, the right first bicuspid and the left first molar; in the lower jaw, the left first and third molars, the right first bicuspid, and the right first and third molars.

The mucous membrane was normal in color and consistency, except for a slight laceration near the vermilion border of the lower lip. The gingival tissue was normal in color and texture except in the region of the symphysis fracture where it was torn and bleeding. The remainder of the oral and facial examination revealed nothing significant.

LABORATORY FINDINGS—All reports were within normal limits and medical clearance was obtained in order to proceed with the oral surgery.

ROENTGENOGRAPHIC EXAMINATION—The roentgenograms revealed a complete fracture of the body of the right side of the mandible that extended into the alveolar ridge anterior to the lower second molar. The fracture was compounded into the mouth. The proximal fragment was displaced superiorly and medially, with an over-riding of the fragments. Also a complete compounded fracture to the left of the symphysis with no displacement could be seen.

HISTORY—The patient had a history of repeated periods of alcoholic intoxication. The past medical and family history was not remarkable.

TREATMENT—On June 27, a closed reduction using Winter arch bars and elastic band fixation was performed. This apparatus remained in place until July 9, at which time postoperative roentgenograms indicated the necessity for reducing and fixing the displaced fragments by open reduction.

On July 9, with the patient under general anesthesia, the mandibular arch bar was removed and an open reduction was performed uneventfully. No. 020 stainless steel transosseous wire was used to fix the fragments. The lower arch bar was replaced after surgery and the elastic bands replaced for intermaxillary fixation later that evening. Intraoral examination at that time revealed no abnormal findings except for gingival blanching and distortion caused by the application of the Winter arch bar and interdental wires. Roentgenographic examination demonstrated proper alignment of the fragments.

On July 13, the elastic bands were changed and the oral cavity cleaned and examined. No unusual observations were recorded and the patient was discharged to the outpatient department.

On July 20, the patient returned for examination and change of the elastic bands. It was noted that he was losing weight and emphasis was placed on proper nutrition. On July 27, he returned for his usual appointment. Examination revealed a ridge of hypertrophic tissue forming bilaterally in the buccal mucosa at the occlusal level of the teeth. The tissue was slightly whiter than the surrounding mucosa and of a firmer consistency. These ridges were composed of a series of sessile masses that corresponded to the spaces in between the rubber bands. Approximation of the buccal tissue against the rubber bands showed that they fit into these spaces perfectly. The patient was unaware of this hypertrophied tissue and denied any habit of cheek sucking. The elastics were changed and the patient dismissed.

On August 3, 1959, the hypertrophic tissue was more pronounced and the patient complained that he was having difficulty in pulling his cheeks from in between the rubber bands. The buccal masses were pedunculated and had grown through the rubber bands to such a degree that it was necessary to peel them away in order to reflect the cheek (Fig. 1). A con-

tinued loss of weight was noted and cheilosis of the lips was seen. Further emphasis was placed on the intake of a proper diet, and a liquid vitamin mixture was prescribed in a 10 cc. daily dosage. (Mulcin was prescribed. It contains the following per 5 cc.: A, 3,000 units; D, 1,000 units; ascorbic acid, 50 mg.; thiamine, 1 mg.; riboflavin, 1.5 mg.; niacinamide, 10 mg.; pyridoxine, 1 mg.; panthenol, 3 mg.; B_{12}, 3 mcg.; biotin, 30 mcg.) In an attempt to prevent the continued stimulation of hypertrophic tissue, a different type of intermaxillary elastic fixation was used. This appliance was fixed to the right side only in order to retain the left side as a control (Fig. 2). It was also observed that the redundant tissue was more pronounced on the right side.

The new elastic appliance was constructed as follows: A piece of ⅛ inch soft rubber tubing was cut to fit the amount of arch to be covered and then the tubing was cut again lengthwise to make a sheet. With a rubber dam punch, holes were made 1 mm. from the edge of the rubber to correspond to the lug distances on the Winter arch bar. The elastic sheet was applied to the arch bar as shown in Figure 3. By replacing the elastic bands with a solid sheet of elastic, it was intended that all the functions of elastic fixation would be continued, but that the irritating characteristics of the bands would be eliminated. Hypertrophic tissue usually regresses when the irritation is removed and if the period of irritation has not been too long; therefore, the patient was observed in order to record any tissue change while he was wearing the two types of elastic fixation.

On August 5, the hypertrophic tissue on the left side was unchanged. On the right side, the side with the new elastic appliance, there was a flattening of the buccal tissue resulting from the mechanical compression of the solid surface of the rubber sheet. There was no demonstrable decrease in hypertrophy at that time. The cheilosis appeared unchanged. Vitamin therapy was continued.

On August 10, the mucosal hypertrophy on the control side (left side) appeared more diffuse and reddened. The shape of the masses was altered, but the excess tissue was still very evident (Fig. 4, left). On the right side, with the solid elastic, there was a definite regression of the mucosal hypertrophy and the tissue appeared normal in color and consistency. Some slight evidence of the former pedunculated masses could be seen in one region, but in general the buccal tissue appeared as normal mucosa without remarkable characteristics (Fig. 4, right).

On August 24, the patient returned to have the arch bars removed. The tissue hypertrophy on the control side was still present,

Fig. 1—Left: Hypertrophy of buccal mucosa, left side, Aug. 3, 1959. Right: Hypertrophy on right side, same day

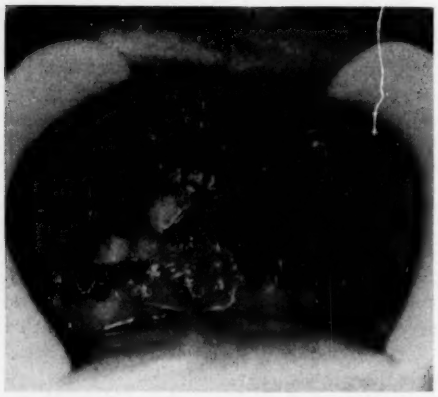

Fig. 2—Application of solid elastic sheet to the arch bar on right side

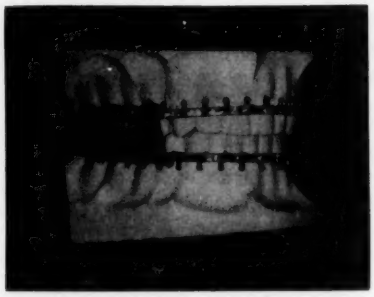

Fig. 3—Application of solid elastic sheet to arch bars

Fig. 4—Left: Buccal mucosa on left side, Aug. 10. Right: Buccal mucosa on right side, same day

whereas the mucosal tissue on the right side was normal in appearance. The cheilosis was no longer present. One of the pedunculated masses on the left side (control side) was excised for biopsy study. The pathologist reported as follows:

"Microscopic examination: Sections revealed normal buccal mucosa with a polypoid structure having a mild submucosal chronic inflammatory response. There is no fibrosis, parakeratosis or acanthosis. No malignancy is seen. The diagnosis is that the oral mucosa and submucosa show polyp formation and mild, chronic nonspecific inflammation."

DISCUSSION—The patient described herein, with hypertrophy of the buccal mucosa, experienced an uncommon reaction to intermaxillary elastic band fixation. He stated that he did not suck his cheeks into the rubber bands. Elastic band fixation was used for a total period of one month before the hypertrophic response appeared. The patient was not well nourished at the time of his initial presentation and con-

tinued to lose weight during the treatment of his fracture. The history of alcoholic consumption made vitamin deficiency a possibility with the resultant loss of oral tissue integrity. This lowered resistance of the oral mucosa may have accounted for the exaggerated tissue response to the elastic band irritation. Vitamin therapy was initiated when cheilosis of the lips and hypertrophy of the buccal mucosa were noticed. A solid sheet of elastic material was used to replace the elastic bands on the right side. The usual rubber bands were allowed to remain on the left side to act as a control for comparison of results. After one week with the new elastic sheet, there was very evident remission of the hypertrophic tissue and in three weeks the tissue appeared normal. The untreated side retained its pathologic characteristics. It was altered in appearance slightly, but this might be attributed to the vitamin therapy. The patient stated that he was able to manage with the solid sheet of elastic as well as with the rubber bands. Eating was possible by placing a straw distal to the elastic and his sucking action was not impaired by the apparatus. It is more difficult to apply the elastic sheet than the individual loops although it may be used with any appliance in place of the rubber loops or band.

SUMMARY—A method of treatment for a mandibular fracture has been developed for use with certain patients. After one month of intermaxillary fixation with elastic bands, the patient in the present instance developed bilateral mucosal hypertrophy of the buccal tissue at the occlusal level of the teeth. The rubber bands on the right side were replaced with a specially constructed solid rubber elastic sheet made from the same tubing material from which the rubber bands were cut. The regular rubber bands were kept on the left side in order to serve as a control for a comparison of effects between the two types of elastic fixation. The solid rubber sheet was attached to the existing Winter arch bar appliance and definite remission of the hypertrophic tissue occurred within one week on the right side. The tissue hypertrophy did not regress on the control side where the elastic bands had been retained. Construction and application of the solid elastic sheet for intermaxillary fixation is explained and its use to prevent buccal hypertrophy resulting from the irritation of rubber bands is recommended.—38 *Oaklawn Drive.*

*Assistant resident in oral surgery, San Francisco General Hospital, San Francisco.

1. Major, G. Fractures of the jaws and other facial bones. St. Louis, C. V. Mosby Co., 1943, p. 125.

■ New Therapeutic Agents

We doctors, while we still retain that measure of control over our practices allowed us by the inspired popular clamor of patients to be dosed, must make the decision whether to give up all along the line and merely hand out the pills, or not. No individual can *dictate* that decision, but I shall here attempt to *influence* it by saying this much: All drugs—even the very best and least noxious of them—are, psychologically or physically, potentially toxic agents; and none of them should be used unless such use cannot reasonably be avoided.—*Harry Beckman. Must All the Drugs Be Used? Wisconsin Medical Journal, March 1959.*

Perforation of the middle third of the face by a foreign body: *report of case*

■ *Frank W. Stewart, D.M.D., Oklahoma City, Okla.*

Accidents involving motor vehicles produce a substantial number of maxillofacial injuries. It is not uncommon after these injuries to find foreign bodies such as glass, gravel, or even bits of metal embedded in the contiguous tissues. The case reported here is that of a perforation of the middle third of the face by a large foreign body. It is unusual in that only minimal damage resulted in a region of complex anatomic structures.

A 47 year old white man was admitted to the hospital December 25, 1958, some two and a half hours after an automobile accident. He stated that he had been riding in the right front seat and that the automobile had struck a concrete bridge abutment.

Clinical examination on the patient's admission to the hospital revealed a through and through perforation of the middle third of the face by an automobile gearshift lever (see illustration, left).

The patient had struck the gearshift lever projecting from the steering column, and it had entered the left side of the face, passing through the maxillary sinus floor, the palate and the oral cavity and exited from the oral cavity through the right anterior tonsillar pillar. The tip of the lever then passed medial and posterior to the neck of the right condyloid process and exited under the ear between the neck of the condyloid process and the right mastoid process. The lever had then broken off and was still in place at the time of the patient's admission to the hospital.

The balance of the clinical examination was negative with the exception of a nondisplaced closed fracture of the inferior third of the right tibia and minor lacerations and abrasions of the face and scalp. The patient was conscious and coherent at the time of admission. He did not appear to be in acute distress and was not in shock. The blood pressure was 110/72 and stable, the pulse 92, respiration 24. The heart and lungs were negative. The balance of the physical examination was within normal limits with the exception of the injuries noted. Two intravenous infusions of 5 per cent dextrose were started with 15 gauge needles, and 4 units of blood were crossmatched for immediate use because of the possibility of damage to the large vessels medial to the mandible.

The patient was taken to surgery and the mouth cleared of bits of teeth, bone and other foreign material. At the request of the anesthesiologist, a tracheotomy was performed with the patient under local anesthesia. A shortened endotracheal tube was then passed through a tracheotomy cannula, and the patient was anesthetized with thiopental sodium, nitrous oxide and oxygen. The face and right side of the neck were prepared thoroughly for surgery with soap and water and tincture of benzalkonium chloride.

The knob on the gearshift lever was unscrewed and the lever slowly withdrawn. There was no bleeding. The left maxillary sinus was cleared of tooth and bone fragments, and suffi-

Left: Perforating foreign body in place at time of patient's admission to hospital. Center: Exit wound three months after injury. Right: Facial appearance three months after injury

cient mucosa was elevated from the lateral surface of the left maxilla to provide a flap for closure of the defect in the antral floor. The through and through laceration of the left side of the face was irrigated with normal saline solution, debrided, and closed in layers with interrupted no. 0000 plain catgut suture. The skin and mucous membrane were closed with no. 00000 interrupted nylon suture. The wound in the right tonsillar pillar and soft palate was irrigated thoroughly from the exterior side and the mucosal side closed with interrupted no. 00000 nylon suture. The subcutaneous tissues then were closed with no. 0000 plain catgut suture, and a drain was placed deep in the exit wound behind the ear. The skin then was closed with no. 00000 interrupted nylon suture. A dry sterile dressing was placed over the exterior wound. The fracture of the right tibia was reduced and a long leg cast applied by an orthopedic surgeon. The patient was returned to his room conscious and in good condition.

On the third postoperative day the drain and all the skin sutures were removed. The sutures in the mouth were removed on the fifth postoperative day. The patient was discharged from the hospital afebrile and in good condition on the sixth postoperative day. At the time of discharge, there was approximately a 50 per cent loss of function of the superior branches of the seventh cranial nerve on the right side with a definite lid lag. The right eye was taped shut and a patch applied. All the operative wounds appeared to be healing well.

The patient was seen again approximately ten days after his discharge from the hospital. At this time the seventh nerve function had improved considerably. The right eye appeared normal. This improvement continued, and when the patient was last seen, approximately three months after the injury, there was almost 100 per cent return of seventh nerve function. Occlusion and mandibular function at the time of this examination were excellent (see illustration, right).

This case is interesting from an anatomical standpoint in that the gearshift lever had passed completely through the middle third of the face with only minimal derangement of important anatomic structures. The only permanent damage resulting from this injury was a loss of three maxillary teeth. It is very unusual that a foreign body as large as this could pass so close to vital structures such as the large vessels medial to the mandible and seventh cranial nerve with no permanent damage resulting.—*1212 North Hudson.*

Oroantral closure with gold plate:
report of case

■ *Martin Steiner,* D.D.S., Ft. Benning, Ga.*

The closure of oroantral fistulas has been accomplished in many ways. This article will discuss the various advantages of using gold plate to close an oroantral fistula. The technic as outlined by Crolius[1] was utilized. Its prime advantages are:

1. The surgical simplicity.
2. Scarring of tissues does not occur and a scar revision is unnecessary.
3. It does not cause obliteration or loss of the mucobuccal fold, as occurs with some buccal flap procedures.
4. It does not cause a palatal defect.
5. It does not require a blood supply as pedicle procedures do.
6. It does not require a prosthetic appliance.

Before the fistula is closed, no matter what method is used for closure, the antrum must be free from infection, or the chances of success will be greatly reduced. Antibiotics and antrum irrigations are used to eliminate the infection, and at the time of operation any polypoid or cystic tissue is removed.

REPORT OF CASE—On March 9, 1957, a 50 year old Negro man presented himself at the out-patient dental clinic of Harlem hospital for removal of an upper right first molar. The tooth subsequently was removed and a free flow of pus was seen to come from the socket. Further eaxmination showed an antral communication. Questioning of the patient revealed he had had chronic sinusitis of the right side for a year but he had never sought treatment for this condition.

TREATMENT—The patient was put on antibiotic coverage and was told to return four days later. On his return, the tissues at the site of the extraction had healed, but an oroantral communication existed. A no. 20 gauge needle

Fig. 1—Left: No. 20 gauge needle inserted into oroantral fistula. Center: Exposure of fistula. Right: Gold plate held in place by overlying sutures

was inserted into the oroantral fistula (Fig. 1, left) and antrum irrigations were instituted. They were carried on three times a week for two weeks. Subsequently the antrum washings were clear and the surrounding tissues showed no signs of infection.

On March 27, the oroantral fistula was closed as follows: An incision was carried along the crest of the alveolar ridge, bisecting the fistula and extending 1 cm. on the distal edentulous ridge. The soft tissue was then undermined with a periosteal elevator and retracted to expose the opening into the sinus (Fig. 1, center). All granulation tissue surrounding the region was removed down to healthy bone.

A piece of 24 carat, 36 gauge, gold plate was cut to a size sufficient to overlap the opening in the bone by 2 or 3 mm. around its entire circumference. The gold was annealed by heating it to cherry red color and quenching in water. The gold plate was then placed over the opening and burnished snugly against the bone. The tissue flaps were returned to place over the gold and held in place by four no. 000 silk sutures (Fig. 1, right). No attempt was made to pull the tissue flaps into apposition. Antibiotic coverage was again instituted.

The patient returned four days later at which time it was found that the lingual margin of the gold plate had perforated the lingual tissue. It was felt that this portion of the gold had not been burnished properly against the bone and that the sharp edge had caused a perforation of the tissue. Local anesthesia was administered and the gold plate was removed. The previous opening had been reduced in size by half. A fine layer of tissue could be seen trying to bridge the opening. The plate was again readjusted over the opening as previously described. The patient again returned four days later and the plate was firmly in place and the surrounding tissues appeared healthy. There was no edema and the patient was very comfortable.

Three days later the patient returned and the sutures were removed. The plate was held firmly in place by the margins of the overlying tissue. The patient was then seen every two weeks and remained completely comfortable. On the eighth week postoperatively, the gold plate had become quite loose but was still in place (Fig. 2, left). At this time, a hemostat was used to remove the plate gently from the tissues. Anesthesia was not used. After removal of the plate a healthy layer of fibrous tissue could be seen (Fig. 2, right). There were little tabs of hypertrophied tissue in the region. The patient was told to return in two weeks at

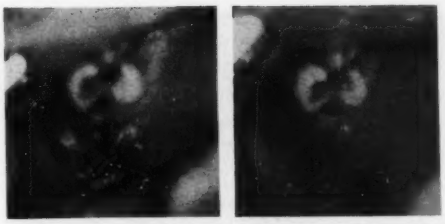

Fig. 2—Left: Eight weeks postoperatively; gold plate in place. Right: Gold plate has been removed

Fig. 3—Two weeks after gold plate has been removed; tenth week postoperatively

Fig. 4—View taken eight weeks postoperatively indicating bone was filling in

which time the hypertrophied tissue had disappeared and the region was completely normal in all respects (Fig. 3). There were no signs of oroantral communication, no scarring of the region, or loss of mucobuccal fold.

DISCUSSION—The gold plate that is inserted is compatible with the surrounding tissues and comfortable to the patient. The actual closure of the fistula is accomplished by the gold plate, or any other metal, acting as a possible irritant to the inner layer of periosteum or simply as a mechanical barrier which protects the normal regenerative powers of the inner periosteum. A soft tissue closure is the usual result, but on some occasions there may be a complete filling in of bone. Figure 4 is a roentgenogram taken eight weeks postoperatively which seems to indicate that there may be a bony closure in this instance.

SUMMARY—A gold plate was used to close an oroantral fistula in a 50 year old patient. This technic has many advantages and should be considered when an oroantral closure is necessary.—*614 Gibson Court.*

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1. Crolius, W. E. Use of gold plate for closure of oroantral fistulas. Oral Surg., Oral Med. & Oral Path. 9:836 Aug. 1956, and personal correspondence.

Multiple molar impactions: *report of case*

■ *Howard B. Adilman,* D.D.S., M.S.D., Chicago; Carl Gold,† D.D.S., Philadelphia, and Leland S. Scott,† D.D.S., Quaker Hill, Conn.*

A case of bilateral mandibular second and third molars and maxillary third molars which were impacted is being reported. Although several cases of bilateral mandibular second and third molar impactions have been reported, no recent cases involving this anomaly in conjunction with impacted maxillary third molars have been found by the authors.

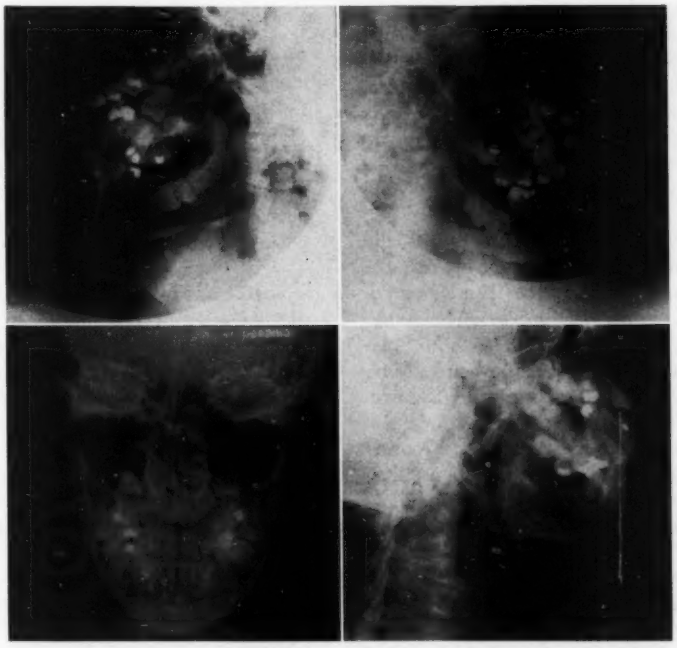
In 1948, Kristal[1] reported a case of bilateral double impactions in a 16 year old boy and in 1956, Arch[2] told of a 19 year old man with the same anomaly. In 1946, Golden[3] and in 1950, Segal[4] reported cases of unilateral mandibular second and third molar impactions.

Kozol[5] in 1949 and Young[6] in 1952 reported cases of third and fourth molars which were impacted in the mandible.

The following case besides being a rare anomaly also illustrates the importance of an adequate roentgenological examination.

HISTORY—A 52 year old white man was given a routine dental examination on January 30, 1958. The examination revealed no clinical evidence of either maxillary third molars or any mandibular molars with the exception of the right first molar which was carious. The only molar the patient remembered having had extracted was the mandibular left first molar. The patient had never experienced pain or discomfort in the molar regions. Several other teeth had been extracted because of dental caries. There was a slight buccolingual expansion of the right mandibular alveolar process in the second and third molar region.

Periapical, occlusal, lateral jaw and posteroanterior roentgenograms at this time revealed six impacted molars (see illustration, above, and below left). The mandibular second and third molars on each side were impacted, as were both maxillary third molars.



Above left: Preoperative lateral jaw view, left side. Above right: Preoperative lateral jaw view, right side. Below left: Preoperative posteroanterior view. Below right: Postoperative lateral jaw view, right side

The patient was admitted to the hospital after clinical and roentgen-ray examination, for the removal of the mandibular right first, second and third molars. It was decided to treat the patient conservatively by removing the molars on only one side of the mandible, then waiting six months to a year before removing the impacted teeth on the opposite side. This decision was made because of the danger of a possible fracture of the mandible, and the surgical treatment plan was designed so as to minimize the possibility of such a complication.

The patient's past history contained no relevant facts other than a recent herniorrhaphy from which he had had an uneventful recovery.

PHYSICAL EXAMINATION—Examination revealed a well-developed, well-nourished, 52 year old white man. The only significant physical finding other than the oral condition was a healing scar from a left herniorrhaphy.

LABORATORY AND ROENTGENOGRAPHIC FINDINGS—All laboratory data were within normal limits. Roentgenograms showed all third molars and the mandibular second molars to be impacted. A recent chest roentgenogram showed no significant abnormality.

HOSPITAL COURSE—On February 18, 1958, the patient was premedicated with pentobarbital sodium 0.1 Gm., meperidine hydrochloride, 75 mg., and atropine sulfate, 0.5 mg. An inferior alveolar nerve block and long buccal infiltration were accomplished with 2 per cent lidocaine containing 1:100,000 epinephrine.

The first molar was extracted because of the large distal carious lesion. An incision then

was made along the crest of the ridge from the distal aspect of the first molar to the retromolar region. A mucoperiosteal flap was reflected buccally and partially along the lingual side, thereby exposing the body of the mandible. With the aid of burs, a 1 cm. core of bone was removed from above the crown of the second molar. The crown was split with burs and chisels, but it could not be removed. The opening in the mandible was enlarged distally to show a perfect interdigitation of the cusps of the second and third molars. Therefore, the second molar crown was sectioned longitudinally and the tooth removed. The third molar then was removed and a primary wound closure made with no. 000 silk sutures after debridement. An extraoral pressure dressing was applied. The postoperative course was routine and the wound healed by first intention (illustration, below right).

The patient was discharged one week postoperatively. He had instructions to wait approximately one year before having the two mandibular molars on the opposite side removed.

DISCUSSION—The most common etiologic factor producing noneruption of molars is the underdevelopment of the jaws.[7] One possible reason for the misplacement of these teeth is that the tooth germs might have been misplaced during their formative phase of growth.[8] Also, the pressure of a developing third molar on the distal surface of a second molar may cause tilting of the latter, which prevents it from coming into normal occlusion.[9]

Blum[10] in 1923 published an analysis of the incidence of malposition of various teeth. He found that out of 267 malposed mandibular teeth only one (0.4 per cent) was a misplaced second molar and 231 (86 per cent) were misplaced third molars. Of 190 malposed maxillary teeth, 62 (33 per cent) were third molars, whereas there were no malposed maxillary second molars.

The chief interest in the case reported lies in the fact that there were a great number of impacted teeth which produced no subjective symptoms and only a slight enlargement of the mandibular right second molar region. Roentgenologic examination was the only accurate means of arriving at the proper diagnosis.

SUMMARY—A case of asymptomatic multiple impacted molars has been reported. A proper and accurate diagnosis was made by means of roentgenographic examination. The mandibular right first, second and third molars were removed without complication. The maxillary right third molar was not removed at this time. The removal of the mandibular left second and third molars was delayed for several months to minimize possible fracture of the mandible.—55 *East Washington Street.*

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1. Kristal, B. S. Bilateral double impaction. D. Radiog. & Photog. 21:53 No. 3, 1948.

2. Arch, J. E. Twin impaction of mandibular second and third molars. J.A.D.A. 52:603 May 1956.

3. Golden, M. G. Removal of impacted right mandibular second and third molars: report of case. J.A.D.A. 33:647 May 1, 1946.

4. Segal, N. A. Case report. Two molars impacted in the ramus. D. Survey 26:957 July 1950.

5. Kozol, S. M. Case of mutually impacted third and fourth molars. Oral Surg., Oral Med. & Oral Path. 2:457 April 1949.

6. Young, J. H. Third and fourth molars impacted crown to crown. D. Survey 28:1668 Dec. 1952.

7. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 34.

8. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 39.

9. Thoma, K. H. Oral pathology, ed. 4. St. Louis, C. V. Mosby Co., 1954, p. 44.

10. Blum, Theodor. Malposed teeth: their classification, pathology and treatment. Internat. J. Orthodont. (Oral Surg. Sect.) 9:122 Feb. 1923.

■ WORDS

Such as thy words are, such will thy affections be esteemed; and such will thy deeds be as thy affections; and such thy life as thy deeds.—*Socrates.*

The practice of oral surgery in the United States is unique

ORAL SURGERY, as it is practiced in the United States, is a specialty which can exist only in an economically independent society, a society free of government health insurance.

The American oral surgeon should count his blessings, for in other areas of the world his specialty is in itself a luxury participated in by those chosen few who hold professorial positions in schools of dentistry or medicine. In practice oral surgery is often buried within the intricacies of general dentistry, the practice of which is commensurate with the economic and social needs of the people.

Abroad, the man who thinks of himself as an oral surgeon is invariably underpaid and overworked, a physician as well as a dentist (without having had the benefits of formal training in his specialty), and a man who learned the essentials of his profession the hard way, with very little material reimbursement. Although he may enjoy his leadership position in the dental profession of his country, he looks at the profession of oral surgery in America with eyes of envy.

We may have our share of problems, but at the same time we have freedoms of a nature that are unknown in other parts of the world. We are also blessed with a growing and active national organization of oral surgeons and have the good fortune of being part of the most powerful dental group in the world, the American Dental Association. Last but not least, we must not discount the advantages of being citizens of a great nation—the United States of America.—*Bruce L. Douglas.*

Dr. Douglas is currently at the Okayama University Medical School, Okayama, Japan, as a Fulbright exchange professor.

■ DENTAL ROENTGENOLOGY. By LeRoy M. Ennis and Harrison M. Berry, Jr. Fifth edition. 607 pages. Index. $15. Philadelphia, Lea & Febiger, 1959.

The book has been considerably enlarged from previous editions by the inclusion of a chapter on radiation and the paralleling technic, and by the addition of many illustrations. To a degree, the scope of the book exceeds its title in some areas, such as the chapter on the chemistry of calcification and in the discussion of case histories and treatment of occlusal disharmonies.

The book contains a wealth of well-illustrated material, but lacks a well-developed index. There is much more information in the book than is listed in the index. The illustrations, paper, and type are the finest. The book can serve as a valuable reference if concessions are made to the lack of an adequate index.—*Robert J. Nelsen.*

■ THE MERCK INDEX OF CHEMICALS AND DRUGS. Edited by Paul G. Stecher, M. J. Finkel, O. H. Siegmund and B. M. Szafranski. Seventh edition. 1,652 pages. $12. Rahway, N. J., Merck & Co., 1960.

The Merck Index is a textbook-size encyclopedia of chemicals and drugs. It has long been an essential reference book for chemists, pharmacists and pharmacologists, and for research workers in all of the health professions. According to the publisher, the book is sold without profit.

The seventh edition is about 50 per cent larger than the sixth, and contains descriptions of 10,000 items, whereas 8,000 were listed in the sixth edition. In the sixth edition, subsidiary names for chemicals and drugs were included in the main part of the book, whereas in the seventh edition all such names appear in a separate 270-page cross-index. The appendix on radioisotopes has been expanded.

There are several entirely new features in the seventh edition. Chromatographic adsorbents and ion exchange materials are listed in a new appendix. There is a new food-calorie table, and a table of Latin abbreviations useful in the writing or interpretation of prescriptions. Nielsen and mouth-to-mouth methods of artificial respiration are described in the appendix on first aid.

The physical qualities of the seventh edition meet the high standard set by earlier editions, and it is competently edited. It can be recommended wholeheartedly to the readers for whom it is intended.—*Donald A. Wallace.*

■ XYLOCAINE—THE PHARMACOLOGICAL BASIS OF ITS CLINICAL USE. By Sten Wiedling. 146 pages. Author and subject indexes. Sw. Kr. 20. Stockholm, Sweden, Almquist and Wiksell, 1959.

The author of this comprehensive summary of the current knowledge of lidocaine (Xylocaine) is a scientist employed by the firm which manufactures Xylocaine.

The subject matter is covered clearly and comprehensively, and the findings of many workers are summarized in convenient tables and graphs. According to the author, there were 400 published articles on lidocaine available at the time this book was written. Nearly 300 references are listed in his bibliography. The book is well edited and the paper, binding and typography are excellent.

This book will be especially helpful to teachers and research workers in pharmacology and anesthesiology. It should be in all libraries of the health sciences.—*Donald A. Wallace.*

■ HEMOPHILIA AND OTHER HEMORRHAGIC STATES. Edited by Kenneth M. Brinkhous and Pietro De Nicola. 266 pages. Index. $7.50. Chapel Hill, The University of North Carolina Press, 1959.

The six chapters of this book bring together the latest developments in the diagnosis and treatment of hemophilia and other hemorrhagic states. It is based on an international symposium on hemophilia held in Rome in September 1958. Recognized leaders in hematology from many parts of the world have contributed to this outstanding volume.

The author has assembled the original papers of the participants of this symposium into a compact, highly scientific treatise. Many recent advances in the general field of hemophilia are presented. The articles are well written and illustrated with many highly technical charts and tables.

The technical nature of this book limits its appeal. It should become a welcome addition to the libraries of hematologists and internists, or members of other disciplines interested in the hemorrhagic disorders. It is too technical and limited in scope to appeal to the medical and dental student, or to general practitioners of medicine and dentistry.—*Robert B. Shira.*

■ SURGICAL AND MAXILLOFACIAL PROSTHESIS. By Oscar Edward Beder. 90 pages with 26 illustrations. $4. Seattle, University of Washington Press, 1959.

Surgical and Maxillofacial Prosthesis fills the need in the publications of today. If there were more books of this type available to the medical and dental profession and the professional schools, a better understanding of their specialties would result. The fairly recent upsurge in group procedures in medical clinics makes the book an essential in their libraries.

The indications and procedures for reconstructive surgery are concise and covered very well. The indications for prosthesis and their construction are well described and adequate for the postgraduate student but not for the undergraduate. The oral surgeon, plastic surgeon and oncologist can get a better understanding of the problem of construction and management of preoperative and postoperative prosthesis after reading this book.

This reviewer found the chapter on functional speech considerations in maxillofacial prosthesis most interesting and enlightening. The book is well written and an excellent text to be used by the dental and medical profession.—*A. G. Anderson.*

■ HYPNOSIS IN GENERAL DENTAL PRACTICE. By Thomas W. Frost. 128 pages with 34 illustrations. Index. $4.50. Chicago, Year Book Publishers, Inc., 1959.

Among the multitude of books relevant to the subject, this volume is one of the few devoted entirely to dental applications of hypnosis. The author presupposes a basic knowledge of hypnosis on the part of the reader, thus permitting a concise, direct, and well-organized consideration of the dental aspects of his subject. The fundamentals of induction and deepening of the trance state are carefully and clearly reviewed. The technics outlined conform to generally accepted procedures which the author has skillfully applied to the everyday problems of dental practice. The subject of dental hypnosis for children is particularly well presented.

A conservative and sensible approach is taken in regard to the limitations of hypnosis, the responsibility of the dentist in electing to utilize hypnosis as an auxiliary to his armamentarium, and in regard to the refractory hypnotic subject.

A detailed table of contents, limited but authoritative references, and an adequate index combine to permit easy reading and ready reference.

In summary, we might say that *Hypnosis in General Dental Practice* gleans the essentials of hypnosis and applies them in a highly competent manner to the practice of dentistry. It will serve as an excellent guide book for the beginner in dental hypnosis and will provide the more experienced practitioner with a convenient reference.—*W. O. Ramsey.*

■ PHARMACOPEIA OF THE UNITED STATES (USP XVI). Prepared by the Committee of Revision. Sixteenth revision. 1,192 pages. Index. $10. Easton, Pa., Mack Publishing Co., 1960.

The U.S.P. is revised at five year intervals, and interim supplements are sent to purchasers of the book without charge. Its specifications for drugs are recognized by law as official. It is customary to list only those drugs in the U.S.P. which are of established value.

Nearly 300 items have been added in the sixteenth revision and 150 which were included in the fifteenth revision have been dropped. Among the additions, lidocaine, meprobamate, nystatin, penicillin V, promethazine HCl and propoxyphene HCl are of particular interest. The omissions include eucalyptol and Peruvian balsam.

Dentistry is not given much recognition in this revision of the U.S.P. Several drugs which are useful and widely used in dentistry are not described, and dental aspects are not taken into consideration adequately in the monographs on procaine and lidocaine. These latter drugs probably are used at least as much by dentists as by physicians. On the positive side, the monograph on sodium fluoride has been improved.

The sixteenth revision is well edited, typographically improved over previous editions, and the paper and binding are very good. It is a uniquely valuable reference text.—*Donald A. Wallace.*

■ PHYSICAL PHARMACY: PHYSICAL CHEMICAL PRINCIPLES IN PHARMACEUTICAL SCIENCE. By Alfred N. Martin. 692 pages with 108 tables and 168 illustrations. Index. $15. Philadelphia, Lea & Febiger, 1960.

This book is directed to the needs of undergraduate students in pharmacy, but it should be of considerable interest to any individuals in the medical sciences who are interested in the construction, stabilization, and evaluation of medicinals. For example, topics include the kinetics of drug absorption, distribution, and elimination, and a discussion of sustained release medication.

The 22 chapters are clearly written and well illustrated. It is designed to be used as a textbook for a first course in physical pharmacy, a course based on one year of college mathematics and one which does not require physical chemistry as a prerequisite. It is in many ways an elementary textbook on physical chemistry and covers the topics normally found in a first course in that subject. It also includes sections dealing with the complexes "micromeritics," solubilization, emulsions, suspensions, and semisolid dispersions. Some of the principles of thermodynamics are introduced in an early chapter. A section on the calculus is included later as a basis for the discussion of kinetics, colloidal phenomena, and a later section on thermodynamics.

The term "physical pharmacy" is of relatively recent origin and there has been considerable question as to what areas of scientific knowledge it should include. This volume is to the reviewer's knowledge the first book to be published with the title *Physical Pharmacy* and as such it is being scrutinized very closely as to scope and depth of presentation.

This outstanding book does a great deal to fill a long-felt need for a text in this field, and should do much to stimulate the writing of the more advanced texts which also are much needed.

The wealth of journal references, worked samples, problems with answers, and the extensive general bibliography, add substantially to its value. Most of the examples and problems use medicinals to illustrate fundamental scientific concepts.

Information on drugs which has been accumulated in tables for the first time includes isotonic values, dissociation constants, solubility data, oxidation potentials, stability constants of complexes, and the pH of a number of pharmaceutical specialties.—*Dwight L. Deardorff.*

■ TUMORS OF THE MAJOR SALIVARY GLANDS. Stanley L. Lane, M.D., D.D.S. Am. J. Surg. 98:904 Dec. 1959.

The proper treatment of tumors of the major salivary glands is resection of the gland. In the parotid gland, if the tumor is in the superficial lobe, superficial lobectomy is the proper treatment. Parotid tumors are five times as common as submaxillary tumors. Parotid tumors are more apt to be benign, and submaxillary tumors are more apt to be malignant. Preservation of the facial nerve is most important when dealing with benign conditions. In malignant tumors preservation of the facial nerve is secondary. The auriculotemporal syndrome of gustatory sweating is a common complication of resection of the parotid gland.—*Myron Kaufman.*

■ SUBPERIOSTEAL SEGMENTAL RESECTION OF THE MANDIBLE. Louis T. Byars, M.D., and William E. Schatten, M.D. Plast. & Reconstr. Surg. 25:142 Feb. 1960.

Subperiosteal resection of the mandible in two patients has been reported previously. Further reports are given on these patients, and another instance is reported in which subperiosteal segmental resection of a benign tumor was followed by regeneration of bone in the bed of the resected mandible.

A nine year old boy was admitted to the hospital for swelling in the region of the left side of his jaw and pain while chewing. There was no history of trauma. A mass in the left side of the mandible involved the molars and bicuspids. There was asymmetry of the face. A biopsy revealed a histologic diagnosis of fibrous dysplasia.

A segmental resection of the mandible was performed through an extraoral submandibular incision. It was possible to preserve all the periosteum on the lingual surface of the mandible. A Kirschner wire was placed in the end of each mandibular fragment to maintain the desired occlusal position. The right upper and lower bicuspids were wired together for additional fixation. The wounds healed by first intention and the interdental wires were removed 17 days postoperatively.

Roentgenograms taken five weeks postoperatively showed the position of the mandibular fragments maintained by the Kirschner wire and beginning deposition of bone in the bed of the resected mandible. The mandible was solid to manipulation at that time. The Kirschner wire was removed four and a half months postoperatively. Roentgenograms taken 5 and 12 months postoperatively showed bone filling the mandibular defect.

An eight year old patient had a subperiosteal resection of an ossifying fibroma of the mandible performed in 1944. Recent photographs of the patient at the age of 23 demonstrate normal occlusion and good asymmetry of the face. In both patients reported previously, regeneration of the mandible occurred promptly.

Segmental resection of the mandible is followed by rapid deposition of bone in the defect when a portion of periosteum is preserved in the mandibular fragments and maintained in their proper relationship. It is likely that bone regeneration will not occur after subperiosteal resection of the mandible in adults.

Subperiosteal resection is applicable only in the excision of a benign tumor of the mandible. This often results in removal of a complete segment of bone. Subperiosteal resection of these tumors would obviate reconstructive procedures that are often necessary to correct deformities resulting from resection.

Internal bar fixation is an effective method of maintaining the proper relationship in mandibular fragments after resection of the fragments.—*Donald B. Rae.*

■ MANDIBULAR PROGNATHISM CORRECTED BY OBLIQUE OSTECTOMY OF THE RAMUS—A NEW, PRECISE, MECHANICALLY CONTROLLED TECHNIQUE. Arthur E. Smith, M.D., D.D.S., and Frank W. Chambers, D.D.S., M.D.S. Am. J. Surg. 98:830 Dec. 1959.

The importance of the growth of the ramus in normal development of the mandible has been recognized for many years. The size and shape of the alveolar arches of prognathic patients are usually harmonious after their relationship has been corrected. Therefore, the configuration of the prognathic mandible seems to verify the fact that the overgrowth of bone occurs mainly in the ramus, perhaps greatly influenced by condylar growth, as in normal development. For these reasons an operation in the subcondylar region, as close to the origin of overgrowth as possible, properly performed, will produce the best anatomic and physiologic results.

In the application of this technic, sound orthopedic surgical principles are followed in order to correct the prognathism, while producing a minimal disturbance of the normal anatomic position of the associated structures, thereby maintaining or enhancing proper function and improving esthetics. The technic for oblique ostectomy of the ramus is described in detail with adequate illustrations. The operation offers the following advantages: (1) the operative area is as near the anatomic origin of the deformity as possible; (2) the subauriculomandibular approach offers adequate exposure for good visualization and access and leaves an inconspicuous scar; (3) there is no oral contamination of the wound; (4) the special self-retaining retractor (as illustrated) offers maximum protection to important blood vessels and nerves mesial to the side of ostectomy; (5) the preoperative study and precise cutting guide assures accuracy of ostectomy; (6) at the site of operation the ramus is devoid of important blood vessels and nerves and is relatively free of muscle attachments; (7) the intact body of the mandible and its contiguous tissues are transposed as a unit; (8) the edge to edge approximation of bone fragments stabilized by interosseous wires, reduces the period of immobilization to a minimum (3 weeks) and prevents an open bite deformity and there is minimal disturbance to or enhancement of the functional positions of the muscles of mastication, floor of mouth and tongue; (9) no teeth are sacrificed and the size of the alveolar arch is not diminished; the acuteness of the gonial angle is increased; (10) the heads of the condylar process are retained in their original position, and (11) the technic requires no elaborate or special method of intermaxillary fixation during the healing process and is an excellent procedure for edentulous patients.—*Myron Kaufman.*

■ ELECTIVE TRACHEOSTOMY IN INFANTS AND CHILDREN. L. R. Rubin, M.D.; B. E. Bromberg, M.D., D.D.S., and R. H. Walden, M.D., D.D.S. Am. J. Surg. 98:880 Dec. 1959.

Elective tracheostomy in children may be performed with safety if the surgeon is thoroughly acquainted with the anatomy of the region and the occasional anomalous situation. Practically all tracheostomy tubes in use today for children and infants are excessive in length. These unanatomical tubes should be revised for use in children between the ages of the newborn to 12 years, and in no instance should they be longer than 5.5 cm. The 90 degree tube, although unsatisfactory in some instances, still possesses the best arc. The tracheostomy tube should be of a smaller diameter than the trachea.

Serious consideration must be given to the performance of an elective tracheostomy in the following situations: (1) when there has been a difficult endotracheal intubation; (2) in surgery about the pharynx, larynx, tongue or mandible, when permanent or temporary respiratory obstruction may be a consequence; (3) in prolonged comatose states, and (4) in trauma to the respiratory tract or lungs such as in a burn, when efficient respiratory toilet is essential. It is only by such continued and diligent attention to detail as has been described, that the tragedies so frequently associated with this procedure may be averted.—*Myron Kaufman.*

■ OBSERVATIONS ON A SENTINEL "NODE" IN CANCER OF THE PAROTID. Earnest A. Gould, M.D.; Theodore Winship, M.D.; Philip H. Philbin, M.D., and Harry Hyland Kerr, M.D. Cancer 13:77 Jan.-Feb. 1960.

The question of whether to do a radical neck dissection or total parotidectomy for carcinoma of the parotid gland has not been settled. There are several factors bearing on the problem. First, some pathologists do not feel they can interpret satisfactorily frozen sections of parotid tumors. Secondly, if lobectomy or total excision of gland is done and a diagnosis of malignancy is received, the en bloc principle of cancer surgery has been violated. In the third place, parotid malignancies vary in frequency of cervical lymph node metastasis, and lastly, a recurrent tumor spreads to regional nodes more than primary cancer.

If the surgeon can establish whether or not the tumor is malignant and if so whether to do a neck dissection, he will do a proper operation and minimize risk of recurrence, metastasis, and the second operation.

Since a frozen section biopsy in 1951 of a normal appearing node at the junction of the anterior and posterior facial veins proved to have a metastatic tumor, 28 parotid tumors have been removed and the sentinel node removed routinely early in the dissection for microscopic evaluation by the pathologist. On three occasions the node contained a malignant tumor, and neck dissection and parotidectomy were done en bloc. In five patients, although the node was negative, the primary parotid lesion was malignant. In the remaining 20 patients the nodes were negative and the tumors benign.

The six to eight year follow-up on the patients with neck dissections shows all living and well except one who died of encephalomalacia eight years after surgery. The patients with negative nodes, malignant tumors, and therefore no neck dissection, show no evidence of recurrence or metastasis in 2 to 8 years.

The lymph node now used routinely for frozen section assay is easily found in the region of the junction of anterior and posterior facial veins. It may be removed easily and parotid dissection may progress during the pathologist's study. This should result in a more reasonable approach to the surgical management of malignant parotid tumors, since the histology of the node may guide the surgeon in his decision concerning the necessity for doing a radical neck dissection.—*Donald B. Rae.*

■ SYSTEMIC FACTORS IN THE ETIOLOGY OF ORAL LESIONS. Balint J. Orban, M.D., D.D.S. Am. J. Surg. 98:809 Dec. 1959.

The generalized statement can be made that systemic factors play a certain role in every oral lesion, if not strictly as primary etiologic factors, then certainly as modifying and aggravating factors. There are 70 diseases of oral mucous membrane which are classified here under clinical as well as etiologic subdivisions. The clinical classification subdivides them as follows: (1) white lesions; (2) bullous lesions; (3) ulcerative lesions; (4) epulids (tumors of the gingiva), and (5) according to color or localization.

According to etiologic factors, six groups have been created to classify the 70 different lesions as follows: (1) infectious diseases—bacterial, mycotic, and viral diseases; (2) noninfectious diseases—inflammatory, dystrophic, and congenital diseases; (3) diseases arising from the metabolic and endocrinic disturbances —diabetes, Addison's disease, pregnancy, and disturbances of the reticuloendothelial system; (4) nutritional and dietary conditions such as vitamin deficiencies; (5) lesions produced by chemical or physical injuries, and (6) oral manifestations of disturbances of the blood-forming organs. This classification is based on etiology as well as pathologic changes of tissues and also on the clinical features. Systemic factors, such as susceptibility or immunity, and constitutional factors play a role in almost every one of the 70 diseases, and consideration of the systemic status of the patient is an essential factor in proper management of the disease. The etiology of many of these diseases might be idiopathic but the pathogenesis often is well understood and must serve as a guide in the planning of treatment.—*Myron Kaufman.*

■ BROKEN THERMOMETER BULB PENETRATING THE SUBMAXILLARY DUCT. John H. Mehnert, M.D. Am. J. Surg. 98:743 Nov. 1959.

Although the breakage of a thermometer in a child's mouth is not infrequent, the medical literature has failed to reveal a single report of related serious injury. The following case was reported because of its unusual nature and demonstrates that a mass appearing spontaneously in the upper part of the neck may represent reaction to foreign material introduced through the floor of the mouth. In this case report breakage of a thermometer in the mouth was followed two years later by the development of a submental tumor mass and an enlarged tender right submaxillary gland. At surgery it was found that the thermometer bulb tip had penetrated the submaxillary duct and was lodged adjacent to it. The mercury released had filled the duct system of the gland and had also gravitated through a sinus tract to the submental skin. It is postulated that mercury deposited in the tissues of the floor of the mouth would probably gravitate to the upper part of the neck rather than being extruded into the mouth. Only a roentgenographic examination or biopsy of the region could reveal the true nature of the process.—*Myron Kaufman.*

■ ORAL CANCER IN WOMEN (A STUDY OF THE INCREASING INCIDENCE). Walter W. Dalitsch, M.D., D.D.S., and Sunder J. Vazirani, M.S., D.D.S. Am. J. Surg. 98:869 Dec. 1959.

An increase in the incidence of oral cancer in women is demonstrated by study of the records of the Cook County Hospital and the Research and Educational Hospitals of the University of Illinois. Other investigators have found a similar trend. This increased incidence in women is associated with an increasing use of tobacco by women and suggests a causal relationship. A long duration of exposure to the use of tobacco prior to onset of the symptoms is a consistent observation. If a degree of prevention of oral cancer is to be achieved, a program must be advocated which will: (1) educate the patient to avoid harmful habits such as smoking, seek early advice and aid if any abnormality is suspected and practice self examination of the oral cavity (similar to the self examination of the breasts which is taught to women), and (2) help to discover and remove or correct noxious influences such as neglected oral hygiene, chronic dental infection and inflammation, mechanical, thermal, actinic and chemical irritants, and early lesions such as leukoplakia and benign growths.

The ratio of females to males according to site of occurrence of the carcinoma was as follows: carcinoma of the lip, 1 to 16.2; of the floor of the mouth, 1 to 18.8; of the buccal mucosa, 1 to 8.5; of the tongue, 1 to 1.6; of the tonsils, 1 to 9.8.—*Myron Kaufman.*

■ BONE INVOLVEMENT IN MAXILLOFACIAL CANCER. A. P. Panagopoulous, M.D., D.D.S. Am. J. Surg. 98:898 Dec. 1959.

The purpose of this study was to compile information concerning bone involvement in maxillofacial cancer. In textbooks and articles there is mention of extension of cancer into osseous regions. This research attempts to document data on the subject.

The material and interpretation were made available by the study of 81 cases of maxillofacial neoplasms over a two year period.

The chief contribution of this work is to clarify the invasion of bone by malignancy through neurovascular channels. The observations presented also may offer a rationale for the clinical management of such cancer.

Mandibular bone was involved in 25 per cent and maxillary bone in 83 per cent as revealed in serial sections of bone specimen. A comparison of roentgenographic and microscopic observations reveals microscopic involvement in some instances which is absent in the roentgenograms. From this study it is not possible to predict malignant involvement of maxillofacial bone in all instances but the mechanism of bone involvement is, by extension, through the neurovascular channels.—*Myron Kaufman.*

■ Bilateral Neck Dissection. Charles J. Staley, M.D., and Edward F. Scanlon, M.D. Am. J. Surg. 98:851 Dec. 1959.

The management of the patient with bilateral metastasis to the cervical lymph nodes is discussed. Nine patients were subjected to complete bilateral radical neck dissection. Four of the procedures were performed in one stage without operative mortality or serious postoperative morbidity. No significant complications attributable to venous engorgement or increased pressure of the cerebrospinal fluid have been noted. Simultaneous bilateral radical neck dissection is a procedure of limited applicability, but is fully justified in selected patients with potentially curable bilateral metastasis to the cervical lymph nodes. All one-stage dissections have been carried out with two surgical teams operating simultaneously. Stage procedures are utilized only when metastases develop on the second side after a previous radical neck dissection. Bilateral dissections are not performed prophylactically. Although the prognosis may be relatively poor, the procedure is performed with intent to cure.—*Myron Kaufman.*

■ Therapy in Cancer of the Head and Neck with Betatron Electron Beam. David J. Lochman, M.D. Am. J. Surg. 98:847 Dec. 1959.

The electron beam is well adapted to treatment of lesions which are unilateral in location and relatively subsurface in depth. Neoplasms of the head and neck that fall into such a category are common. Parotid tumors, tumors of the tonsillar fossa, of the maxillary sinuses, of the tongue, of the buccal mucosa and the gingival margins, or those involving a pyriform sinus, are examples of suitable types. Treatment can be confined to a single side of the oral cavity or pharynx. Homogeneous dosage is placed throughout the tumor-bearing region, including in most instances the primary route of lymphatic dissemination. The volume of tissue that must be treated uselessly is considerably reduced.

Although systemic effects of radiation never constitute a problem in radiotherapy on the head and neck, such manifestations as nausea and depression of bone marrow are virtually nonexistent when the electron beam is used. The suppression of salivary and mucous gland secretion, which greatly contributes to the discomfort of the patient undergoing conventional or even super voltage radiation treatment, is only partial. In this study, all teeth were removed prior to starting therapy. One week was allowed for healing before starting treatment. In younger patients with better oral hygiene, a policy of removing only those teeth which will be in the field of radiation was carried out. This is done because the bone receives about 60 per cent greater dosage than the adjacent soft tissue. The rapid dental decay which follows salivary suppression from radiation has not been seen with electron beam therapy up to the present time. Short term follow-up of a limited number of patients is encouraging but evaluation of survival must await further data.—*Myron Kaufman.*

■ Surgical Management of Intraoral Cancer. Arthur Loewy, M.D. Am. J. Surg. 98:844 Dec. 1959.

The surgical management of intraoral carcinoma is discussed with special consideration of the regions and extent of involvement. The disadvantages of radiation and the contrasting advantages of various surgical concepts are presented in broad generalities. It is concluded that although radiation is still a serviceable and effective modality, surgical excision of intraoral cancer at present appears to offer more for the patient than do other methods of treatment. It offers equivalent or better survival rates; it is more likely to offer greater immediate comfort to the patient, and it is no more deforming a procedure than radiation with its immediate and late effects. The limitations to surgery of tumors of the oral cavity are discussed and its indications for application are mentioned. The advantages of electrosurgery for the removal of small localized malignancies are covered.—*Myron Kaufman.*

Announcements

■ First Advanced Institute on Hospital Dental Service

As an outgrowth of basic institutes on hospital dental service held over the past four years in various cities in the country, the first such advanced institute will be held November 29-December 1 by the American Hospital Association in cooperation with the American Dental Association. The sessions will be held in the auditorium of the American Hospital Association building in Chicago and are sponsored by the Tri-State Hospital Assembly, the Illinois Hospital Association and the Chicago Hospital Council.

Expansion of dental services in relation to administration, diagnostic services and community dental care will be discussed in detail. Among the speakers will be J. Ted Howell, M.D., Saul Levy, Frank M. Wentz, Leland Weyer and Mr. John Hollweg, architect with the U. S. Public Health Service.

■ Teacher Training in Oral Biology at Loyola

Loyola University School of Dentistry, the Chicago College of Dental Surgery, is offering a research and teacher training program in oral biology.

The course, under a teacher training grant from the National Institutes of Health, is designed for candidates wanting a teacher's career in basic sciences or in clinical subjects. The stipends are up to $5,000 per year, and the program can lead to an advanced degree.

Further information can be obtained by writing to Dr. Harry Sicher, Loyola University School of Dentistry, 1757 W. Harrison St., Chicago 12.

■ Oral Surgery Internship Open in Knoxville, Tenn.

A one-year internship in oral surgery, approved by the Council on Dental Education of the American Dental Association, is being offered at the University of Tennessee Memorial Research Center and Hospital, Knoxville.

The department (dentistry and oral surgery) is affiliated with the Cleft Palate Clinic at the East Tennessee Children's Hospital and the intern participates in this clinic as part of his training.

The post carries full maintenance and salary of $300 per month. Inquiries should be addressed to the medical director of the hospital, Alcoa Highway, Knoxville, Tenn.

■ Third Conference on Graduate Education in Oral Surgery

The Third Conference on Graduate Training in Oral Surgery, sponsored by the American Society of Oral Surgeons, will be held Monday, November 28, immediately preceding the Advanced Institute on Hospital Dental Service.

The theme of this conference will be the effective use of hospitals in advanced education. Among the speakers who will talk on various aspects of this subject are John F. Stapleton, M.D., James T. Howell, M.D., and J. Edward Berk, M.D. Applied basic sciences in the graduate pro-

gram will be discussed by Paul Nemir, Jr., M.D., and Robert S. Myers, M.D., will speak on the development of a practicable medical audit method. A panel discussion on the hospital as an educational institution will be held by these five speakers.

After a luncheon over which Claude S. LaDow will preside, there will be talks on the organization of the oral surgery teaching program by Morgan L. Allison; integration of oral surgery education with other professional divisions of the hospital by Richard J. Burch; collaboration of the educational institutions in development of a total oral surgery education plan by Merle L. Hale, and human relations in interprofessional programs by William J. Lahey, M.D.

Edward C. Hinds, M.D., University of Texas Dental Branch, will preside at the conference which will be held at the headquarters building of the American Hospital Association in Chicago.

■ Refresher Course in Anatomy Listed at Virginia School

The Medical College of Virginia announces a five-day course March 6-10 on anatomy of the head and neck. The course, under the direction of Alton D. Brashear, professor of anatomy, will include a dissection by course participants. Clinical application to problems in oral surgery and prosthodontics will be emphasized. The fee is $75 and the class is limited to ten students. Further information can be obtained by writing to H. T. Knighton, School of Dentistry, Medical College of Virginia, Richmond, Va.

■ Archives of Clinical Oral Pathology Now Available

Sets of unbound volumes of the *Archives of Clinical Oral Pathology* (1937-1940) are now available to the profession. The 1,425 pages of illustrated text of original communications relate to dental and oral, basic and clinical sciences. The contents include clinical case reports, editorials, abstracts of oral pathology, historical data, and, of special importance, the *George B. Winter Memorial Issue.*

The set of four volumes is $10. Details can be obtained by writing to the New York Institute of Clinical Oral Pathology, 101 E. 79 St., New York 21.

■ Four Named as Section Officers for American Dental Association

The Board of Trustees of the American Dental Association has appointed the following as section officers for 1961: Section on Anesthesiology, Harry M. Seldin of New York City, chairman, and R. Quentin Royer of Rochester, Minn., vice-chairman; Section on Oral Surgery, Gustav O. Kruger of Washington, D. C., chairman, and James R. Hayward of Ann Arbor, Mich., vice-chairman.

■ Internships Offered at Philadelphia Veterans Hospital

The Veterans Administration Hospital, Philadelphia, is now accepting applications for the one year rotating internships available July 1, 1961. The program is given in cooperation with the affiliated dental and medical schools. A certificate of internship is awarded by the hospital. Further information can be obtained from S. L. Orlean, chief of the hospital's dental service. The address is University and Woodland Ave., Philadelphia 4.

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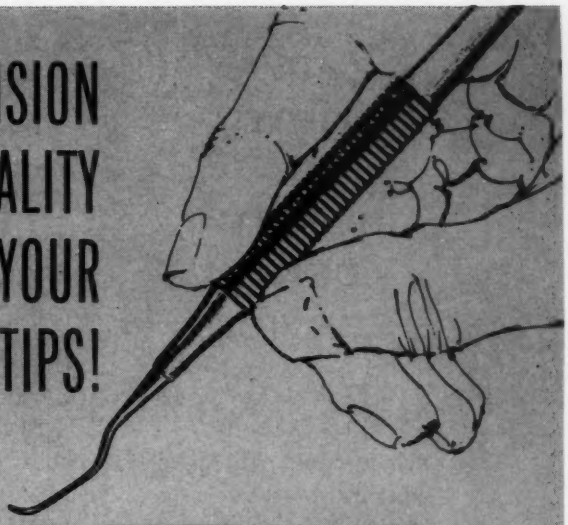

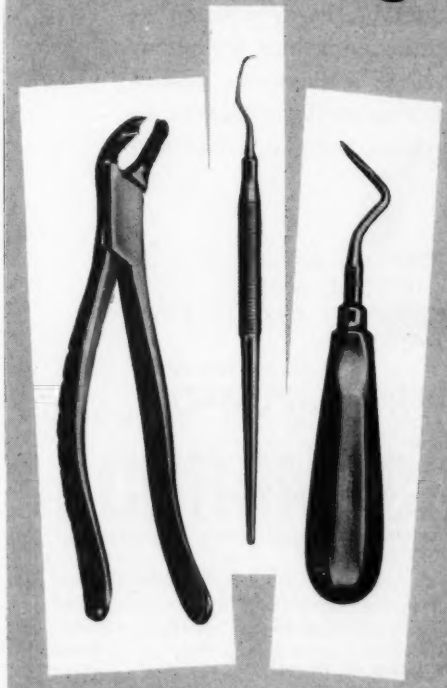

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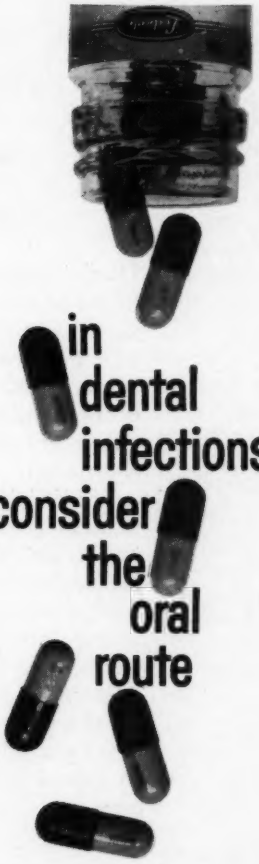

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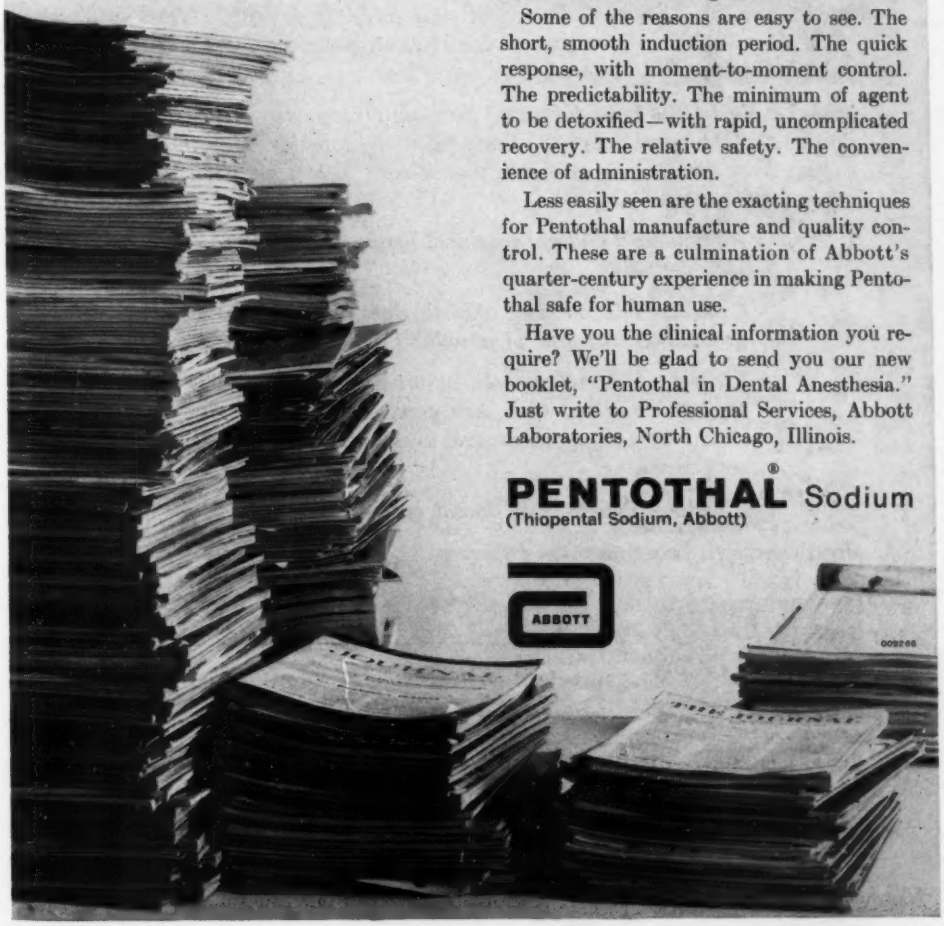

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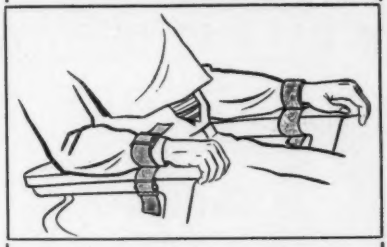

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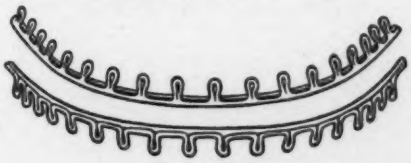

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